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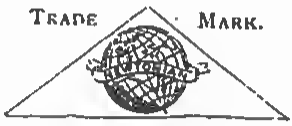

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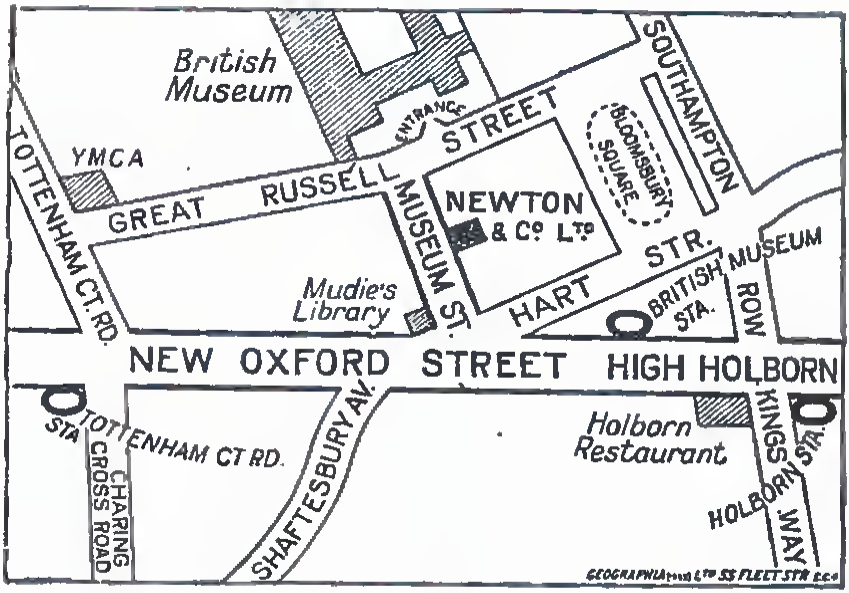

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It was our conviction of the importance of providing only the latest and most accurate and authoritative information for educational work that caused us to ask the help of Mr. Phillips, the Secretary of the Royal Astronomical Society, and it is his courteous and able assistance alone that enables us to publish this very valuable new series of illustrated lectures on Modern Astronomy.

We hope it will prove a successful means of bringing before those who know nothing of the marvellous progress of this great science during the past few years, the entire change of outlook caused by the great discoveries—notably that of Einstein—which have recently revolutionized both Physics and Astronomy.

It is doubtless difficult for anyone who is not an accomplished mathematician and scientist to grasp the full meaning of Einstein's Relativity Theory, but the reference to it and the illustrations in Lecture I. of this series will enable the student to understand something of what that theory means, and also something of the wonderful influence it must exercise on the future development of Astronomy and Physical Science. But it is not only the young for whom these Lantern Lectures are suitable; they are intended also for adult audiences, as, not only do they describe the results of the wonderful discoveries that have been recently made, but they give an accurate and able record of the position of Astronomical Science at the present time (1928), and should further developments take place which increase our knowledge on this subject or vary the theories and ideas at present held, it is intended to add such slides and details as may be necessary, to keep them up to date.

Without such aid as that given by Mr. Phillips, a course of lectures like this could not have been produced, and we are indebted also to most of the famous Observatories for assistance in the provision of the excellent sets of slides with which the lectures are illustrated and which help effectively to a clear understanding of this great subject.

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MODERN ASTRONOMY—*Continued.*

The following are the titles of the 6 Lectures by the Rev. T. E. R. PHILLIPS, M.A., F.R.A.S., late Secretary (now President) of the Royal Astronomical Society—

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SUN.

1 Total Eclipse, with Corona, Aug. 7, 1869.
2 Solar Eclipse, 1869, as seen in America.
3 Corona of December, 1871, drawing (Mr. Ranyard).
4 Corona of January 1, 1889 (W. H. Pickering).
5 Corona on the Sun's Disc, January 11, 1889 (Todd).
6 Solar Eclipse, 1883.
7 Total Solar Eclipse of April 16, 1893. Eight Pictures of Solar Corona,
8 Total Solar Eclipse of April 16, 1893, Ex. 25 seconds.
9 ,, ,, ,, ,, Ex. 8 seconds,
10 ,, ,, ,, ,, Ex 16 seconds.

(Nos. 7-10 taken with the Photoheliograph Lens of 40-feet Focus, by J. M. Schaeberle at Mina Bronces, Chile (Lick Observatory Expedition).

ASTRONOMY—*Continued.*

SUN—*continued.*

11 Eclipse taken with the Dallmeyer Lens of the Lick Observatory, by J. M. Schaeberle, April 16, 1893.
12 Total Eclipse, 1898.
13 Solar Corona, 1898, January 22, taken at Jeus, India. (Campbell.)
14 Total Eclipse of the Sun, 1600 (Mrs. Walter Maunder.)
15 Partial Eclipse of the Sun, 1900. (Horley.)
16 Total Eclipse of the Sun, 1901 (Mrs Walter Maunder.)
17 Corona of 1901, May 18. (Royal Alfred Observatory, Mauritius.) (1) Exposure, 2 secs.; time, 22 secs. after second enntact. (2) Exposure, 8 secs.: time, 145 secs. after second contact. 2s. 3d.
18 Corona round the South Pole of the Sun. Total Solar Eclipse, May 18, 1901. (Mauritius.) 2s. 3d.
19 Solar Eclipse, 1905.
20 Partial Eclipse as seen by the naked eye, 1912 (London).
21 Partial Eclipse, 1912. Shadow coming on.
22 " " " " " "
23 " " " " " "
24 " " " " " "
25 " " " Maximum of shadow.
26 " " " Shadow passing off.
27 " " " " " "
28 " " " " " "
29 " " " " " "
30 " " " " " "
31 Partial Eclipse of Sun, Jan. 1924. 3 5, (London.)
32 " " " " " " 3.15. "
33 " " " " " " 3.45. "
34 Sun, 22nd October, 1905. (E. W. Barlow.) 2s. 3d.
35 Sun, 13th February, 1907, 10.1 a.m. Greenwich Civil Time. (E. W. Barlow.) 2s. 3d.
36 Sun's Surface, showing the structure of the Photosphere, 1892. (Janssen.)
37 Sun's Surface, showing Spots and Photosphere
38 Spectograph of the Solar Chromosphere. (Hale.)
39 Photograph of Solar Photosphere and Spot of Sun Spot, minimum type.
40 Rice Grein of Photosphere Sun Spots, maximum type. (Janssen.)
41 Life History of a Sunspot Group, illustrating four types. Drawing, 1884. 2s. 3d.
42 Artificial Sun Spots. Part of a photograph of the Sun, taken in 1893, August 9, 10 hours 19 mins. 25 secs. Greenwich mean time, at the Royal Observatory, Greenwich, with the Thompson Photoheliograph of 9 inches aperture (Negative image.)
43 Sun, showing Sun Spots and Faculae, August 28, 1893. (Lick.)
44 " " " " August 30, 1893. (Lick.)
45 " " " " September 3, 1893. (Lick.)
46 " " " " September 4, 1893. (Lick.)
(Nos. 43-46 show the same group of spots in its passage across the disc. From negative taken with the Photoheliograph.)
47 Portion of the Sun's Disc, showing Groups of Spots: May 15, 1894. (Lick.)
48 " June 18, 1894. (Lick.)
49 " June 19, 1894. (Lick.)
50 " June 19th, 1894 (Lick.) Enlargement of the principal group of spots shown on No. 49
51 " June 20th, 1894. (Lick.)
(Nos. 48-51 show the same group of spots they are all from Negatives taken with the Photoheliograph.)
52 Great Group of Sun Spots of Sept. 3-15, 1898, as photographed at the Royal Observatory Greenwich.
(1) Taken 1898, Sept. 8 days, 10 h. 29 m. 19 s. Greenwich Civil Time.
(2) " " " 9 days, 14 h. 59 m. 2 s. Greenwich Civil Time.
(3) " " " 10 days, 10 h. 40 m. 6 s. Greenwich Civil Time.
53 Great Sunspot of 1903. October, 9 days, 3 h. 43 m. Calcium Flocculi, Middle H, Level. 1903, October, 9 days, 1 h. 4 m., Hydrogen Flocculi. 2s. 3d.
54 Change of appearance of Solar Spot, caused by rotation of sun.
55 Artificial Sun Spots. (1) Wooden Ball, showing Rotating Spots. (2) An ordinary Spot. (3) Wooden Ball, showing Spot on the Limb.
56 " (4) An Active Spot. (5) A Spot after an Upheaval. (6) a Dying Spot.
57 Sun Spots and the Solar Photosphere. (Janssen.) June 10, 1887.
58 " " enlarged, surface showing Rice grain.
59 Solar Spots, October, 1905.
60 The Great June Sunspot. Photograph of the Sun, taken in "K" light, 20th June, 1907, at 12 h. 47 m. p.m. 2s. 3d.
61 Solar Prominences observed by Zollner, Aug. 29 1869
62 " " " " " Aug. 29. 1869.
63 " " " " " Aug. 29 1869.
64 " " " " " Aug. 29, 1869.
65 " " " " Respighi, 1870
66 " " " " "
67 Portion of the Sun's Limb during Eclipse, 16th April, 1893, showing Solar prominences and lower portion of the Corona.
68 " " showing Solar promiuences and lower portion of Corona.
69 " " showing Solar prominences and lower portion of Corona.
70 " " showing Solar prominences and lower portion of Corooa.
(Nos. 67-70 taken with the 40 feet Photoheliograph by J. W. Schaeberle at Lick Observatory).
71 Photograph of the "Reversing Layer," in two portions and photograph near Mid-Totality, showing Coronal Ring in 1474 Light.
72 Map showing eclipse shadow across England and Europe. January, 1927.

MOON.

Most of the slides in this group can be supplied in blue tone, if desired, at an extra cost of 6d. per slide.

100 Orbit of Moon.
101 Phases of Moon.
102 Earth as seen from the Moon.
103 Age 4 days, 3 hr. July. Ex. 7 hrs. 51 mins. (Lick.)
104 Age 4 days, 12 hrs. Nov. Ex. 5 hrs, 37 mins (Lick.)
105 Age 7 days, 14 hrs. Nov. Ex. 7 hrs. 8 mins. (Lick.)
106 Age 8 days, 16 hrs. July. Ex. 9 hrs. 1 min. (Lick.)
107 Age 9 days, 2½ hrs. Oct. Ex. 7 hrs. 32 mins (Lick.)
108 Age 8 days, 10 hrs, 7 mins. March. Ex. 10 hrs. 3 mins. (Greenwich.)
109 Age 10 days, 5½ hrs. March. Ex. 13 hrs. 16 mins. (Lick.)
110 Age 12 days Oct. (Lick.)
111 Age 12 days, 8 hrs.
112 Age 13 days, 1 hr. Oct. Ex. 10 hrs. 19 mins. (Lick.)
113 Age 16 days Oct. (Lick.)
114 Age 19 days 8 hrs August Ex 12 hrs. 39 mins (Lick.)
115 Age 21 days, 5 hrs. Nov. Ex. 13 hrs 58 mins. (Lick.)
116 Four Quarters. North Region, 1909. 2s. 3d.
117 " " East Region, 1909. 2s. 3d.
118 " " West Region, 1909. 2s. 3d.
119 " " South Region, 1909. 2s. 3d.

ASTRONOMY—*Continued.*

MOON—*continued.*

LUNAR REGIONS

120 Sunrise on the Sea of Plenty. March. Age, 4 days, 6 4 hrs. Ea. 6.5 hrs. (Paris). 2s. 3d.
121 South Pole. 167 hrs. old.
122 Two views. Sunrise (left). Sama region 5½ days later (right). (W. H. Pickering.)
123 System of Bright Rays about Tycho. (Yerkes.)
124 Region about Tycho. 240 hrs. old. Dec. (M. M. Henry.)
125 ,, ,, 265 hrs old Dec. (M. M. Henry.)
126 Region about Crater Tycho. Age 240 hrs.
127 Lunar Appearances. Age 8 days, 1 hr. 7 mins. March. Ea. 6 hrs. 6 mins. Scale 44 ins. (Paris.) 2s. 3d.
128 Where Four Mountain Ranges meet. Age 20 days, 5 9 hrs. Sept. Ea. 14 1 hrs Scale 24 ins. (Paris). 2s. 3d.
129 Lunar Alps and their neighbourhood. Age 5 days, 1 hr. April. Ea. 17 hrs. 8 mins. Scale, 26.6 ins. (Lick.)
130 Alhategnius (North). March. (M. M. Lowey and Puiseux.)
131 Mare Serenitatis, Mare Tranquilitatis and Surroundings. (Yerkes.)
132 Lunar Craters Clavius, Longomontamoes, Tycho, etc. (Yerkes.)
133 Clavius and his neighbours. (North.) Oct. (Lick.)
134 Lunar Crater Theophilis and Surroundings. (Yerkes.)
135 Mare Nubium, Billiaidus, etc. (Yerkes.)
136 Ringed Plains of Mare Nubium. Age 22 days, 14 hrs. 1 min. Sept. Ea. 18 hrs. Scale 23 ins. (Paris.)
137 Lunar Crater Copernicus and Surroundings. (Yerkes.)
138 Sunset on the Ptolemaus.
139 Maurolycus. (North.) March. (M. M. Loway and Puiseua.)
140 Sunset in the Mare Crisium. Age 18 days, 13 hrs. July. Ea. 21 hrs. 14 mins. Scale, 36 ins. Lick.
141 Mare Crisium, region of.
142 Partial Eclipse, 9.20 p.m. May, 1892. (G. J. Nawhegin.)
143 ,, ,, 9.50 p.m. ,, ,, ,,
144 ,, ,, 10.30 p.m. ,, ,, ,,
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147 ,, ,, 12 p.m. ,, ,, ,,
148 ,, ,, 12.30 p.m. ,, ,, ,,
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175 Comparative sizes of Sun and Planets.
176 Jupiter, showing bands, Moons.
177 Jupiter, and inset showing earth and Jupiter on same scale as the Planet.
178 Jupiter November. (W H Pickaring.)
179 Jupiter and its markings. August 1, about 7 hrs. 50 mins. 10 in. Reflector, power 312, W F D 2s. 3d.
180 ,, April 22, about 8 hrs. 30 mins. 10 in. Reflector, power 312, W F D 2s. 3d.
181 Jupiter and its markings. August. 2s. 3d.
182 Jupiter, taken with enlarging Lens in 36 in. Telescope, (Lick.)
183 ,, ,, ,, ,, ,, September 28th.)
184 Region of the Great Red Spot on Jupiter August, 1902. 2s. 3d.
186 Saturn, showing broad rings.
187 ,, showing edge of rings.
188 ,, as observed from October, 1848, to March, 1851.
189 ,, showing broad rings and moons.
190 ,, as seen from one of its Satellites.
191 ,, November. (W. H. Pickering.)
192 ,, September 13 days 6 hrs. 40 mins G.M.T. Jan (Drawing by Mons E.M. Antoniadi.)
193 Mars and Moons.
194 Telescopic Appearance of the Planet Mars, April, 1903. 2s. 3d
195 August 16th. Λ=298° (T. E. Phillips.)
196 September 14th. Λ=4° (T. E. Phillips.)
197 September 23rd. Λ=289° ,,
198 October 4th. Λ=166° ,,
199 October 11th. Λ=107° ,,
200 November 8th. Λ=204° ,,
Mars from drawing as seen through a 10-inch Teleseope.
201 Mars, two illustrations with canal system, 1895 (Lowell).
202 The Hour-glass sea on Mars. (1) Dawes, Nov. 26th, 1864. (2) Flammarion, June 29, 1873. (3) Schiaparelli, June 28, 1878. (4) Schiaparelli, June 2, 1888. (5) Schiaparelli, June 20, 1890. (6) Gale, August 6, 1892. (7) Lowe, October, 1894. (8) Phillips, December 3, 1898. (9) Antoniadi, December 7, 1898.
203 Venus (1) Antoniadi, June 11, 20 hrs. 45 mins.
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(4) ,, July 12, 23 ,, 45 ,,
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206 Neptune and Moons.
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230 Hallay's list of 24 orbits of Comets.
231 Halley's Comet, giving extent of Orbit.
232 Halley's Comet, 1835.
233 Halley's Comet, Jan., 1910.
234 Halley's Comet, Jan. 30th, 1910. Ea. 74 mins. 34 inch reflector (Greenwich).
235 Donati's Comet, October, 1858.
236 Donati's Comet, 1858.
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238 Coggia's Comet No 1.
239 Swift's Comat. April 4, 6 and 7, 1892. (Prof. E. E. Baroard.)
240 Comat, 13th July, 1893 (Rordame).
241 Brook's Comet, October 21, 1898.
242 Great Southern Comet, May, 1901. (E. W. Maunder.)
243 Morehouse Comet (C. Waller.)
244 ,, ,, 1908c, 24th October, 1908, Exposure, 50 mins. 2s, 3d.
245 Daniel's Comet, track of, as seen Aug. 13, 1907.
246 ,, ,, ,, ,, ,, Aug. 25, 1907.
247 ,, ,, August, 1907. Star with black spot near end of tail is 7. Geminorum. Exposure, ¾ hour. Meanee Observatory, New Zealand. 2s. 3d.
248 Great Daylight Comat. February, 1810. 2s. 3d.
249 Findlay's Comet.
250 A Shooting Star.
251 A Meteoric Shower.
252 Radiant points of Meteors.
253 Ring of Meteoric bodies round the Sun.
254 Meteor traces of the Region of the Milky Way about ξ Cygni. Sept. (Dr. Max Wolf.)
255 The Great Meteorite of Willamalte. 2s. 3d.
256 Torrid Fire Ball. Pole star trails in addition Ea. 8 hrs. 58 mins.-11 hrs. 12 mins. Nov. 18, 1922. 2s. 6d.
257 N. Pola alar trails. Ex, 8 hrs. 46 mins., 18 hrs. 0 mins. Sept. 7, 1823. 2s. 6d.

ASTRONOMY—*Continued*

NEBULAE.

Most of the slides in this group can be supplied in blue tone, if desired, at an extra cost of 6d. per slide.

275 Map, Nebulae and Clusters of the Northern Heavens
276 " " " Southern Heavens.
277 Great Nebulae in Orion. Exposure 37 mins. January 30, 1883. 3 ft. Reflector, Ealing.
278 The Belt of Orion and Great Nebulae, March, 1891. (Dr H. C. Russell.)
279 Belt and Sword of Orion on 2nd February, 1902. Exposure, 2 hrs 40 mins. (Taken by A. Smith, Dalbeattie.) 2s. 3d.
280 Great Nebulae in Orion.
281 Nebulae, Orion. (Drawing by Mr. Lassells.)
282 Nebulae in Orion. (W. E. Wilson.)
283 Great Nebula in Orion. (Yerkes.)
284 Great Nebula in Orion. (Yerkes.)
285 Great Nebula in Orion, Central part. (Yerkes.)
286 Dumb-bell Nebulae in Vulpecula. August 6, 1894. (W. E. Wilson.)
287 Dumb-bell Nebula Vulpecula. (W. E. Wilson.)
288 Annular Nebulae in Lyra. November, 1890 (M. Trepied.)
289 Ring Nebula Lyra. (W. E. Wilson.)
290 η Argus Nebula. (Dr. H. C. Russell, of Sydney.)
291 η Argus Nebulae. March, 1892. (Dr. Gill.)
292 Great Nebulae about η Argus. (Drawing by Sir John Herschell.)
293 Nebecula Major. (Dr. H. C. Russell.)
294 Nubec Major No. 1.
295 " " No. 2.
296 Nubecula Major, nr Greater Magellanic Cloud, April 6th, 1893: 3 hours exposure. (J. M. Schaeberle.)
297 Nebecula Minor, March, 1891. South. (Mr. H. C. Russell.)
298 Nebulosities surrounding the Pleiades December 6 and 8, 1893 (Barnard) (Lick Observatory)
299 Nebulosity in the Pleiades (Yerkes Observatory) 2s. 3d.
300 Nebulosity in the Pleiades (Yerkes.)
301 Nebulosities near Antares and Nu Scorpii June 21 22, 1894. (Barnard) (Lick Observatory)
302 Aristarchus and the Sinus Iradium. 1896 Oct. 18, 18 hours 32 minutes 41 seconds 47 S. Greenwich mean time, with the 36 inch reflractor. (Lick Observatory.)
303 One thirtieth of the Sky April, 1899. (Mrs. Walter Maunder.)
304 Nebula H V 14 Cygni. (W. E. Wilson.)
305 The "America" Nebula in Cygnus. 1901, July 12 and 13. Total exposure 4½ (Dr Max Wolf) 2s. 3d.
306 The "America" Nebula in Cygnus 2s. 3d.
307 Vicinity of Beta Cygni Exposure 2 hours. (Alexander Smith.) 2s. 3d.
308 Nebula in Cygnus, N G C. 6960 (Yerkes.)
309 " " " 6992 (Yerkes.)
310 Spiral Nebula, Canes Venatica (W. E. Wilson.)
311 Spiral Nebula, Messier 33 Trianguli. (Yerkes.)
312 Spiral Nebula, Messier 51 Canum Venaticorum. (Yerkes.)
313 A Spiral Nebula in Canes Venatica.
314 Great Nebula near Ophiuchi (E. E. Barnard.) 2s 3d.
315 Great Nebula in Andromeda 2s. 3d.
316 The Cluster in Hercules Sept. 1894. (W. E. Wilson.)
317 Cluster M. 13 Hercules. (W. E. Wilson.)

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361 The Star Cluster ω Centauri. May 25, 1892. (Dr. Gill.)
362 Region of the Milky Way in Sagittarius. July, 1890. (E. E. Barnard.)
363 The Milky Way in Sagittarius. (E. E. Barnard.)
364 The Milky Way in Sagittarius. August, 1890. I. (E. E. Barnard.)
365 The Milky Way in Sagittarius. August, 1890 II. (E. E. Barnard.)
366 Photograph of the Milky Way in Sagittarius. March, 1891. (H. C. Russell, of Sydney.)
367 The region of the Milky Way, about ξ Cygni December, 1891. (Dr. Max Wolf.)
368 The region of the Milky Way, about ξ Cygni. December, 1891. (Dr. Max Wolf.)
369 The Region of the Milky Way, about α Cygni, with an exposure of 13 hours, October, 1891. (Dr. Max Wolf.)
370 Region of the Milky Way about ε Cygni. October, 1891. (Dr. Max Wolf.)
371 The Region of the Milky Way about α Cygni, with an exposure of 13 hours October, 1891 (Dr Max Wolf.)
372 The Milky Way in Cygnus. August, 1899, with a Dallmeyer stigmatic lens of 1½ in. aperture and 9 in. local length. Field 38° side. Exposure, 6½ hours. (Mrs. Walter Maunder.) 2s. 3d.
373 The Milky Way in Aquila August, 1890. (Prof. E. E. Barnard.)
374 Photograph of the Milky Way in Norma, taken with the Star Camera of the Sydney (New South Wales) Observatory.
375 Cruces and the Coal Sack Region of the Milky Way. August 13, 1890. (H. C. Russell.)
376 Region of the Milky Way to the North of the Trifid Nebula (E. E. Barnard.)
377 Region of the Milky Way about ζ Cephei (Dr. Max Wolf.)
378 Central part of Region of the Milky Way.
379 The Milky Way in the Constellation Cepheus, showing the nebulous region and dark structures March, 1894.
380 The η Argus Region of the Milky Way, taken with the Bruce Photographic Telescope of 24 in. aperture and 11 ft. focus. June 1, 1896, at Arequipa, Peru. (Prof. Bailey.)
381 The Milky Way round Ophiuchi. (E. E. Barnard.) 2s. 3d.
382 Star Cluster, Messier 13 Hercules. (Lick Observatory.)
383 " " Messier 15 Pegasi. (Lick Observatory.)
384 Clusters in Perseus: reduced from Negative taken with the 36 in. Telescope. (Lick Observatory.)
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ASTRONOMY—*Continued.*

STARS—*Continued.*

388 The Pleiades Telescopic view. 2s. 6d.
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391 ,, (1) Nova (3, 1901) Persei. 2s. 3d.
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393 Northern Sky. Position of guiding stars in the middle of February, 6 p.m., January, 10 p.m., December, midnight, November, 2 a.m., October, 4 a.m.
394 ,, ,, Position of guiding stars in the middle of April, 10 p.m., March, midnight. February 2 a.m. January 4 a.m. December 6 a.m.
395 ,, ,, Position of guiding stars in the middle of July, 10 p.m., June, midnight, May, 2 a.m.
396 Northern Sky. April, 4 a.m.
397 ,, ,, Position of guiding stars in the middle of November, 8 p.m., October 10 p.m., September, midnight, August, 2 a.m., July, 4 a.m.
398 Southern Sky. Position of guiding stars in the middle of February, 8 p.m., January, 10 p.m., December, midnight, November, 2 a.m., October, 4 a.m.
399 ,, ,, Position of guiding stars in the middle of April, 10 p.m., March, midnight, February, 2 a.m., January, 4 a.m., December, 6 a.m.
400 ,, ,, Position of guiding stars in the middle of July, 10 p.m., June, midnight, May, 2 a.m., April, 4 a.m.
401 ,, ,, Position of guiding stars in the middle of November, 8 p.m., October, 10 p.m. September, midnight, August, 2 a.m., July, 4 a.m.
402 Relative Distances of the Stars.
403 Galileo's Drawing of the Stars in Orion.

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426 Solar Spectrum. The Great B. group. September.
427 Solar Spectrum, the D and rain band Group. September.
428 Solar Spectrum. The E group and 1474 Region. September.
429 Solar Spectrum. Region between D1 and D2.
430 Solar Spectrum Region between H and h. September.
431 Solar Spectrum. G Region. September.
432 Solar Spectrum. P to O Region. September.
433 Solar Spectrum, H and K Lines. September.
434 Solar Spectrum. Region L and K. September.
435 Eclipse Spectra, photographed with Prismatic Camera, 2 inch aperture, 36 inch focus.
436 Spectra of Chromosphere. Comparison of enhanced lines and α Cygni.
437 Spectra of Corona Chromosphere. Comparison and Sun.
438 Spectra of Chromosphere and Sun. Comparison.
439 Spectra of Sun Absorption.
440 Curves of known and unknown line in Sunspot Spectra.
441 Solar Spectrum and Spectrum of Solar Prominences during Total Eclipse.
442 Solar Spectrum and Spectrum of Various Gases, viz.: Hydrogen, Oxygen, Ruhidium. Cs. Ll. Na.
443 Solar Spectrum enmpared Spectra of Planets Lyrae. Pegasi. Orion.
444 Solar Spectra as compared with Star Spectra.
445 Spectra of Stars. α Lyrae and Nova Aurigae.
446 Stella Spectra. (1) Bellatria, (2) λ Cygni, (3) δ Cygni, (4) β Arietes, (5) Procyon, (6) Arcturas. March With 6 inch Prismatic Camera.
447 Spectra. Sirius, Arctauris Antares and Red Star.
448 The Spectra of the Major Planets. Photographed hy V. M. Slipher. Lowell Observatory, Flagstaff. Decemher. 2s. 3d.
449 Stellar Spectra, Ascending Series.
450 Spectra of Nova Persei and Procypn. (1) 1901, March 3, 6 p.m.; (2) March 21, 8½ p.m.; (3) March 25, 8½ p.m. (Stonyhurst College Observatory). 2s. 3d.
451 Spectrum of Nova Persei, II. 1901: (Stonyhurst College Observatory.) 2s. 3d.
452 Spectra of Nova Aquila. June 6-18.
453 Up-and-Down Spectra of Sirius, taken with the up-and-down motion, showing how oblique are the Spectra produced by this method.
454 Comparison of Spectra of Sirius and α Cygni, with enhanced lines added β Lyrae, one for each day.
455 Spectra of Sirius. 8 inch Prismatic Camera (2 Prisms, 45°).
456 Comparison of Spectra of Procyon and γ Cygni, with the enhanced lines added.
457 Comparison of α Cygni and the enhanced lines of certain metals. Chiefly of the iron group.
458 Spectra of Cygni. 80 min. exposure. Scale 5·0: (8 inch Prismatic Camera, 2 Prisms, 45°).
459 Spectra of Cygni Arcturas.
460 Spectrum of Vega (Bros. Henry.)
461 Spectrum of δ Orionis, showing the lines due to O.N. and C.
462 Spectrum of α Orionis with metallic comparisons.
463 Spectra of Arcturas. (8 inch Prismatic Camera, 2 Prisms, 45°.)
464 Spectra of Procyon. 75 min. (8 inch Prismatic Camera, 2 Prisms, 45°.)
465 Spectra of Vega. 80 min. exposure (8 inch Prismatic Camera, 2 Prisms, 45°.)
466 Spectra of Bellatrix with the Hydrogen and Cleveite Gases.
467 Delimitions of general Stellar Spectra.
468 Stellar Evolution Map. Diagram illustrating the Stellar Evolutinn as based on spectroscopic observations.
469 Metals up. Diagram showing the behavinur of metals in atars increasing their temperatura.
470 Metals down. Diagram ahowing tha behaviour of metals in stara decreasing in temperature.

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534 A Rainbow, taken at Juvisy after a violent storm, June, 2 days, 5 hrs. 20 mins. 2s. 3d.
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540 Cyclone in Atlantic sweeping towards Europe.

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550 Signs of Zodiac on Ceiling of the Temple of Dendera.
551 Zodiac and Seasons.
552 Figures on Greek Coins.
553 Orion.
554 Ursa Major.
555 Ursa Major (Little Bear) in four positions and polestar.
556 Draco and Ursa Major.
557 Hercules.
558 Auriga.
559 Taurus.
560 Southern Cross.
561 Cepheus, Cassiopeia, Andromeda and Perseus.
562 Aries, Taurus and Gemini.
563 Cancer, Leo and Virgo.
564 Lebra, Scorpio and Sagittarius.
565 Capricornus, Aquarius and Pices.
566 Cygnus, Lyra, Aquila and Antinous.

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568 ,, ,, The floating Earth.
569 ,, ,, Earth with roots.
570 ,, ,, Earth of Vedic priests.
571 ,, ,, Earth of Anaximander.
572 ,, ,, Plato's Cubical Earth.
573 ,, ,, Homeric System.
574 ,, ,, System of Cosmas. No. 1.
575 ,, ,, ,, ,, ,, 2.
576 ,, ,, Earth as a floating Egg.
577 ,, ,, Eighth century map of world.
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580 ,, ,, Homeric Cosmogony.
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582 Ptolemaic System.
583 Pythagorean System.
584 Tychonian System.
585 Apparent direct and retrograde movements of the Planets.
586 Newtonian System.
587 Astronomical origin of the names of the days of the week.

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597 The Orbit of the Earth.
598 Inclination of the Axis of the Earth
599 Earth travelling round the Sun, and Moon round the Earth.
600 Shadow of the Earth.
601 The Earth's Figure and Dimensions
602 Eclipse of Sun by Earth, as seen from Moon.
603 Herschel's Theory of the Universe.
604 Causes of Eclipses of Sun and Moon.
605 The Sun's Rays.
606 A Magnetic Storm, and its relation to the Solar Prominences.
607 Spheres in Space. Diagram by T. E Heath. 2s. 3d.
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609 Spring Tides.
610 Neap Tides
611 Curvature of the Ocean
612 The Terrestrial Skeleton Globe.
613 The Mariner's Compass.
614 The Winds, table of Velocity and Forces.
615 Atmospheric Refraction.
616 Atmospheric Refraction in the Polar Seas.
617 Duration of Light and Darkness.
618 The Rainbow.
619 " " Double Bow.
620 " " Drops of Rain.
621 Lunar Rainbow.
622 Planetary Motion, No. 1.
623 " " No. 2.
624 " " No. 3.
625 Parallax of the Planets.
626 Formation of Spectrum through Prism.
627 Pupils learning the relative positions of the planets on an open-air model at a School in Granada.
628 Motto: "The Heavens declare the Glory of God," designed in stars.

OBSERVATORIES.

650 Greenwich Observatory Westgate Old Buildings
651 " " showing Domes.
652 " " from Garden.
653 " " building containing the Thompson Telescope
654 " " Observatory Building from the roof of the new building.
655 " " Altazimuth Observatory.
656 " " Observatory Building from the Courtyard showing the Transit Building, the Computating Offices, and the Time-signalling Department.
657 Lick Observatory, Great Dome, and Observer's House.
658 " " in Winter.
659 Yerkes Observatory South Front.
660 " " The Ninety-Foot Dome
661 " " Sheathing the Ninety-Foot Dome.
662 Harvard College Observatory, Pinhole Photograph.
663 Mr. Isaac Robert's Observatory, Crowborough, Sussex.
664 Dr. Max Wolf's Observatory, interior, at Heidelberg.
665 Oxford University Observatory.
666 Melbourne Observatory

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675 Tycho's form of Transit Circle.
676 Astrolabe. An old instrument with sights for roughly marking the positions of the Celestial bodies.
677 Telescope of 17th century
678 Gregorian and Cassegrainian Reflectors.
679 Newtonian and Herschelian Reflectors.
680 Halley's Transit Telescope
681 " College Exercise Book, with original Observations and Computations of his Comet.
682 " College Exercise Book.
683 " Quadrant.
684 Greenwich Observatory. The Thompson Telescope.
685 " " The Thompson Telescope. The 30 inch Reflector, with the new Spectroscopic Attachment.
686 " " The Chronagraph.
687 " " The Time-Signalling Desk.
688 " " The half prism Spectroscope on the South-East Equatorial.
689 " " The site of the Greenwich Meridian.
690 " " The Magnetic Pavilion.
691 " " The Magnetic Dip Instrument.
692 Lick Observatory 36 in. Equatorial Telescope. Near view
693 " " 36 in. Equatorial Telescope.
694 " " 36 in. Equatorial Telescope. Eye-end.
695 " " 36 in. Telescope, Eye end, close view.
698 Lick Observatory. 36 in. Telescope. Micrometer.
697 " " 36 in. Telescope. Spectroscope.
698 Yerkes Observatory, 40 in. Telescope.
699 " " 40 in. Telescope. Erecting the Declination Axis.
700 " " Clock Room.
701 " " Filar Micrometer.
702 " " Alvan G. Clark and Car Lundin with the Crown Lens of the 40 in. Objective.
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15 " "
16 Photograph of the South Pole.
17 Photograph of the Moon, 240 Hours Old.
18 Photograph of the Moon 265 Hours Old.
19 Region about Tycho.
20 Sunset on the Ptolemaeus.
21 Part of Surface of Moon.
22 Mauroiycus (North).
23 Albategeius (North).
24 Clavius and his Neighbours.
25 Photograph of the Moon taken at Greenwich Observatory.
26 The Lunar Alps.
27 Sunset on the Mare Crisium.
28 Sunrise on the Sea of Plenty.
29 Where Four Mountain Ranges Meet.
30 The Ringed Plains of the Mare Nubium.
31 Eclipse of the Moon, May 11th, 1892.
32 " "
33 " "
34 " "
35 " "
36 " "
37 " "
38 Theophilus, Cyrillus and Catharina.
39 Arzachel Ptolemy and the Railway.
40 Plato and its Surroundings.
41 Mercator and Campanus.
42 Tycho and its Surroundings.
43 Aristarchus and Herodotus.
44 Overlapping Craters.
45 Wargentin
46 Normal Lunar Crater.
47 Diagram of Lunar Craters.
48 Skeleton Map of the Moon.
49 Eclipse of the Sun seen from the Moon.
50 Back of Hand and Shrivelled Apple.
51 Gassendi.
52 Lunar and Earth Surfaces Compared.
53 Copernicus.
54 Lunar Apennines.
55 Ideal Lunar Landscape.
56 Triesnecker.
57 Aristotle and Endoxus.
58 The Full Moon.
59 "
60 Crater of Vesuvius, 1865

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6 Artistarchus and Herodotus
7 Overlapping Craters
8 Wargentin
9 Normal Lunar Crater
10 Diagram of Lunar Craters forming a series ranging from 1½ to 78 miles diameter, all containing central cones
11 Skeleton Map of Moon
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13 Back of hand and shrivelled apple. To illustrate the origin of certain mountain ranges
14 Gassendi
15 Portion of the Moon's surface. Vesuvius and neighbourhood of Naples. Terrestrial and Lunar Volcanic areas compared
16 Copernicus
17 The Lunar Apennines. Archimedes, etc.
18 Group of Lunar mountains. Ideal Lunar Landscape
19 Triesnecker
20 Aristotle and Endoxus
21 Full Moon
22 " "
23 Crater of Vesuvius, 1865

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Eclipse Expedition to India, 1898.

1 H.M.S. "Melpomene"
2 " Officers
3 Approaching "Viziadrug Fort, the Station that was occupied
4 Viziadrug Fort
5 " " Pier
6 The Camp. First day after arrival
7 " " Middle of the first week
8 " " A week after our arrival
9 " " General View, looking East
10 " " Panoramic View taken before the Eclipse
11 Group of Observers taken after the Eclipse
12 The Eclipse Clock showing how the dial was graduated spirally
13 The 6in. grating Spectroscope with Professor Pedler and Staff
14 The 3½ Telescope with Sir Norman Lockyer
15 The Hut containing Coronograph and Integrating Spectroscope
16 The Kinematograph worked by the Marquis of Graham
17 Siderostat and Cameras as arranged for Meteor Observations No. I.
18 Siderostat and Cameras as arranged for Meteor Observations. No. II.
19 Dark slide (running plate) used in the 6in. Prismatic Camera
20 Apparatus for enlarging Star Spectra
21 Plan of part of the Viziadrug Fort, showing positions of instruments

Stellar and other Spectra.

22 Up-and-down Spectra of Sirius taken with the up-and-down motion, showing how oblique are the Spectra produced by this method
23 Comparison of Spectra of Sirius and α Cygni, with enhanced lines added
24 β Lyræ, one for each day
25 Comparison of Spectra of Procyon and γ Cygni, with the enhanced lines added
26 Stellar Spectra, Ascending Series
27 Spectrum of δ Orionis, showing the lines due to O. N. & C.
28 Comparison of α Cygni and the enhanced lines of certain metals. (Chiefly of the iron group)
29 α Orionis with metallic comparisons
30 Comparison of enhanced lines with Chromosphere (1898) and α Cygni
31 Comparison of Corona Chromosphere (1898) and Sun
32 Comparison of Chromosphere and Sun
33 Bellatrix with the Hydrogen and Clevelte Gases
34 Metals up. Diagram showing the behaviour of metals in stars increasing their temperature
35 Metals down. Diagram showing the behaviour of metals in stars decreasing in temperature

Stellar Spectra taken with a 6in. Prismatic Camera (2 Prisms 45°):—

36 Arcturus. (18 May, 1898)
37 Procyon. (23 Dec., 1898). 75 min.
38 Sirius
39 Vega. (17 April, 1898) 80 min. exposure
40 α Cygni. (17 April, 1898) 80 min. exposure. Scale 5–0.
41 Definitions of Stellar Genera
42 Stellar Evolution Map. Diagram illustrating the Stellar Evolution as based on spectroscopic observations
43 Constellations near Leo for November meteors
44 Map of Spain with 1900 Eclipse track marked

Eclipse Expedition, 1896.

45 H.M.S. "Voiage" in Bras Haven, Lapland.
46 " " " " " anchored
47 " " " " " casting the anchor
48 " " The Volunteer Observer on board
49 " " The Ship's Company
50 " " An Officer
51 The 9-in. Prismatic Camera worked by Dr. W. J. S. Lockyer, No. 1
52 " " " " " No. 2
53 Group near 9-in. Prismatic Camera, (1) Dr. W. J. S. Lockyer, (2) Lieutenant Martin, (3) Sir Norman Lockyer
54 The 6-in. Prismatic Camera worked by Mr. A. Fowler
55 The 3½-in., with Sir Norman Lockyer
56 The erection of a Disc
57 " " " " by Lieutenant Martin, R.N.
58 General View of the Eclipse Camp
59 " " " " " nearer view
60 Kil's Fjord, Lapland
61 Our Marine Guard
62 Chart of Sky in region about Sun during the Eclipse
63 What we saw of the Eclipse
64 The Integrator and its staff of workers
65 Group of Observers, taken after the Eclipse
66 Packing up after the Eclipse

Eclipse Expedition to India, 1898.

67 The 9-in. Prismatic Camera
68 " " " worked by Dr. Lockyer and his Naval Staff
69 The 9-in. " " worked by Mr. Fowler and his Naval Staff
70 Despatch of Instruments for Eclipse, 1898
71 Group on board H.M.S. "Melpomene"
72 Eclipse Camp
73 Excursionists from Bombay to Viziadrug to view the Eclipse
74 Government Packers at work
75 Our Police Guard

Instruments.

76 6-in. Prismatic Camera with two prisms
77 9-in. " " with one prism
78 " " Reflector, two prisms
79 " " Prism
80 Eclipse Telescope 6-in. Prismatic Camera with one prism, as arranged for Eclipse work
81 Stand for 9-in. Prismatic Camera, as used in the Indian Eclipse, 1898
82 9-in. Transit at South Kensington
83 Coronograph as used at Novaya Zambya in Eclipse, 1896
84 Driving Screw of 36-in. Common Reflector
85 Integrating Spectroscope as used in Eclipses 1896 and 1898
86 Celestial Globe, adjustable for precessional movement
87 Stellar Spectra of Cygni Arcturus
88 Hammerslay Grating Spectroscope, for observation of widened lines in Sun Spots, Solar Physics Observatory
89 Curves of known and unknown line in Sunspot Spectra

P GREENWICH OBSERVATORY.

Plain Slides, 2s. each.

1 The new building containing the Thompson Telescope.
2 The Thompson Telescope.
3 „ The 80-inch Reflector, with the new Spectroscopic Attachment.
4 General view of the Observatory Building from the roof of the new building.
5 The new Altazimuth Observatory.
6 The Chronograph.
7 The Observatory Building from the Courtyard, showing the Transit Building, the Computating Offices, and the Time-signalling Department.
8 The Time-signalling Desk.
9 The half-prism Spectroscope on the South-East Equatorial.
10 The site of the Greenwich Meridian.
11 The Magnetic Pavilion.
12 The Magnetic Dip Instrument.

For other Slides of Greenwich, see page 92 and "Geography," Section 5 of this Catalogue.

WU THE STARRY HEAVENS.

Arranged by Professor R. A. Gregory, F.R.A.S., Oxford University, Extension Lecturer, Professor of Astronomy in Queen's College, London.

Typed Notes, *1s. 6d.*

Plain Slides, 2s. each.

1 Galileo's Drawing of the Stars in Orion
2 The Great 36 in. Equatorial Lick Observatory
3 Relative Distances of the Stars
4 Region of the Milky Way about Cygni
5 „ „ „ „
6 Central part of region of Milky Way
7 Photo of the Nebecula
8 Argus Region of the Milky Way
9 The Great Nebula in the Pleiades
10 Nebulosities surrounding the Pleiades
11 The Star Cluster in Centauri
12 The Great Nebula in Orion
13 The Nebula in Andromeda
14 The Annular Nebula in Lyra
15 Spiral Nebulæ
16 Star Clustar
17 Dumb-bell Nebula in Volpecula
18 Prismatic Camera for photographing the Spectra of Stars
19 Spectrum of Vega
20 „ Arcturus
21 Series of Spectra of Stars increasing in temperature
22 Spectrum of the Sun compared with the spectrum of a Star
23 The Moon taken at the Lick Observatory

BNE THE FOUNDATION OF THE UNIVERSE.

THE WORLD OF ATOMS.

By kind permission of Messrs. George Newnes, Ltd. Most of the Slides have been reproduced from the well-known publication "The Outlines of Science."

Descriptive Notes will be found in Vol. I., pages 177–206.

Plain Slides, 2s. each, except where otherwise marked.

1 The Foundation of the Universe. A very early conception—the World on the back of an elephant.
2 Newtonian System.
3 J. Clerk-Maxwell.
4 John Dalton.
5 Comparative size of Molecules of Starch, Water, Dyes and Hydrogen atoms.
6 The Brownian Movements.
7 The Brownian Movement.
8 A Soap Bubble.
9 What is a Million?
10 Sir W. Crookes.
11 Prof. Rontgen.
12 Crookes Maltese tube showing fatigue.
13 Electric discharge in a vacuum tube.
14 Heating effect of Cathode rays.
15 Early form of X-ray tube with Cathode.
16 An early X-ray photograph.
17 A recent X-ray photograph.
18 The Spectrum. (Coloured 10s.)
19 An Electroscope.
20 Relative size of atoms and electrons compared with the Hemisphere.
21 Atom drawn to scale, to the size of St. Paul's Cathedral, showing sizes of Electrons.
22 Prof. Curie.
23 Madam Curie.
24 Spectrum of Emanition of Radiom. 3s.
25 Spectrum Radium. 3s.
26 Sun Spots.
27 Electrons streaming from the sun to the earth.
28 Hydrogen atoms as originally explained by Sir Oliver Lodge 2s. 6d.
29 Radium „ „ „ „ 2s. 6d.
(Explanatory notes supplied for the above two slides.)
30 Sir W. Ramsey collecting emanitions of radium.
31 „ „ „ experimenting with a gold leaf Electroscope.
32 „ „ „ charging a gold leaf Electroscope with radium.
33 Explanatory diagram of Sir W. Crook's Spinthariscope.
34 Spinthariscope effect. Rack slide, 15s.
35 Electrons produced by passage of X-ray through air.
36 The Theory of Electrons.
37 Magnatic deflection of Radium rays.
38 Arrangement of Atoms in a Diamond.
39 Disintegration of the Atom.
40 An electric current discharged from positive pole.
41 „ „ „ „ negative „
42 Flash of Lightning. 2s. 6d.
43 Magnetic circuit of an electric current.
44 Arrangement showing similar poles of two bar magnets.
45 Arrangement showing dissimiller poles of two bar magnets.
46 Electrified Hand.
47 Light waves.
48 Mail Steamer at full speed.
49 Wave Shapes. 2s. 6d.
50 Wave track of a ship. 2s. 6d.

BXR THE HISTORY AND DEVELOPMENT OF WIRELESS TELEGRAPHY

We are indebted to the Marconi Wireless Telegrapb Co., Ltd., for kind permission to publish this magnificent series of Slides on the History and Development of Wireless Telegraphy. Additional slides will be provided sbowing the progress made from time to time.

Plain Slides, 2s. each.

Typewritten Lecture, price 2s. 6d., or can be loaned with the Slides.

When ordering Slides, please quote title of group required.

A.—HISTORICAL AND EXPERIMENTAL.

1 Plain aerial transmitter with condenser connection to earth.
2 Short distance apparatus.
3 G. Marconi and apparatus.
4 South Foreland Lighthouse Marconi mast.
5 G. Marconi on Poldhu cliff.
6 Early experimants with kite aerial.
7 Groups taken at Newfoundland, 1901.
8 Chart ni North Atlantic showing tracek of "Carlo Alberto" and "Philadelphia," 1901.
9 Magnetic detector—the first step in improvement of receivers from coherers.
10 Multiple tuner—nsed in conjunction with the magnetic detector.
11 The first direct wireless message—England to Australia—1918.
12 Professor Fleming—of valve fame.

B.—OBSOLETE AND OBSOLESCENT APPARATUS.

1 Early wireless installation on a ship—spark transmitter and coherer detector.
2 Transmitting Jiggar at Carnarvon station—obsolete apparatus.
3 Marconi Field station.
4 Engine and dynamo saddles for portable station.
5 Rotary disc discharger.
6 1½ kw. transmitting condenser—open.
7 1½ kw. transmitting condenser—closed.
8 Tray of Leyden Jars for early transmitter.
9 1½ kw. converter and disc discharger.
10 Carnarvon disc transmittec.
11 Clifden valva transmitter.
12 Ballyhunion. The ½ kw. telephona transmitter for speech to Cape Breton, Canada, in March, 1918.
13 Carnarvon valve panel.
14 Crystal receiver for ships.

C.—COMMERCIAL TELEGRAPH SERVICES "VIA MARCONI."

1 Radio Honra, Londoo—The Marcoal Central Telegraph Office.
2 A continental circuit at Radio House.
3 Aerial aystem of 50 kw. station, Ongar.
4 50 kw. Transmitter at Oogar.
5 Brentwood receiving station aerials.
6 Brentwood commercial receivers.
7 Berne Marconi statioo—exterior.
8 Berne Marconi station—25 kw. valve panel.
9 Marconi magnetic drum recorder.
10 Creed printer.
11 Carnarvon trans-Atlantic station. Distant view.
12 Single atayed 400 ft. lattice mast. Carnarvon.
13 Marconi House.

D.—BEAM WIRELESS.

1 Inchkeith reflector. 6 metres.
2 Early short waver directional transmitter.
3 Early short waver directional receiver.
4 South Foreland reflector 10 metres.
5 Sonth Foreland reflector contact arm.
6 Beam receiver s.s. "Royal Scot."
7 Beam receivec aerial s.s. "Royal Scot."
8 Parabolic reflector.
9 Plane reflector.
10 Bodmin Beam station—Sonfh African masts.
11 Bodmin Beam station—Power House.
12 Bodmin Beam station—Transmitters.
13 Bodmin Beam station—Feeders.
14 Bodmin Beam station—masts and Balance weights.
15 Beam "radiation" diagram.
16 Broadcast "radiation" diagram.
17 Ralstive audibility beam and broadcast—diagram.
18 Map of world with great circle tracks.
19 Comparative polar curve.

E.—DIRBCTION FINDING AND DIRBCTIONAL RECEPTION.

1 Marconi direction finder for ships.
2 Marconi direction finder for aerodromes, etc.
3 Marconi direction finder for lifeboats.
4 Marconi direction findar for aircraft.
5 Marconi directional receiver for commercial serviees.
6 Direction finder aerials, s.s. "Minnewaska."
7 Direction fioder aerials, fixed frame type.
8 Direction finder aerials, Basla aerodrome.
9 Aerial system for "heart-shaped" reception.
10 "Heart-shaped" diagram.
11 Diagram of D.F. componenta and aerials.
12 Position finding from two stations.
13 Mouth of Channal and D.F. Stations.

F.—MARITIME WIRELESS.

1 Quenched apark transmitter.
2 Emergeney break transmitter.
3 1½ kw. valva transmitter for ships.
4 Four alectrode valve.
5 1½ kw. station complete with D.F.
6 Senator Marconi on Yacht "Elettra." (1824).
7 Wireless cabin on Steam Yecht "Elettra." (1924).
8 Senator Marconi's Yacht "Elettra."

G.—AIRCRAFT—PORTABLE AND FIELD STATIONS.

1 Marconi Transmitter at Croydon (to be replaced 1927).
2 Croydon Aerodrome aerials—transmitting.
3 Croydon Aerodrome Marconi D.F. receiver.
4 1½ kw. telephone and telegraph transmitter for aerodromes.
5 AD. 6 set in aeroplane.
6 100 watt telegraph-telephone set—field station.
7 Wireless Call Bell (transmitter).
8 Wireless Call Ball (receiver).

H.—BROADCASTING.

1 Marconi standard 6 kw. broadcasting transmitter.
2 Madame Melba broadcasting from Chelmsford, 1920.
3 Bournemouth Station Marconi Transmitter.
4 "Tha Home of Wireless"—Marconi House.
5 Chelmsford aerial.
6 London 2LO aerial.
7 Part of London transmitter.
8 Daventry Station—general view—interior.
9 Daventry Station Control table, drive and magnifier panels.
10 Big Ben microphone in position.
11 Glasgow station control room.
12 The first broadcast transmitter—Writtle Marconi station.

THE HISTORY AND DEVELOPMENT OF WIRELESS TELEGRAPHY—*Continued.*

J.—GENERAL INTEREST SLIDES.

1 25 kw. Poulsen arc.
2 Building a 400 ft. mast at Carnarvon.
3 Building a 400 ft. mast at Carnarvon, showing building derrick.
4 400 ft. mast complete—Carnarvon.
5 A large iceberg.
6 Pair of telephones.
7 High frequency alternator—New Brunswick.
8 Marconi works—Chelmsford.
9 Senatore Marconi in laboratory.

K.—DIAGRAMS, ETC.

1 Mechanical analogy for Hertz oscillator with water tank.
2 Evolution of Hertz oscillator in Marconi aerial.
3 Section of telephone receiver.
4 Fleming valve diagram.
5 Microphone circuit and battery.
6 Scale of ether vibrations.
7 Damped and undamped waves.
8 Umbrella "T" and "L" aerials.
9 Comparison of Carnarvon and ship station wave lengths.

L.—PHOTORADIOGRAMS.

1 President Coolidge—trans-Atlantic transmission.
2 Photoradio transmitter—Ranger system.

BEF WIRELESS TELEGRAPHY.
(POULSEN SYSTEM.)

We have been fortunate in securing a number of interesting negatives illustrating the Poulsen System. Descriptive notes have been written by Mr. C. F. Elwell, who is specially qualified to write with knowledge and authority regarding the development of this system of long-distance Wireless Telegraphy.

Plain Slides, 2s. each. Typewritten Notes, 4s. 6d., or can be loaned with the Slides.

1 Prof. Clerk-Maxwell.
2 The Maxwell Theory.
3 Heinrich Hertz.
4 Hertz's apparatus.
5 Guglielmo Marconi.
6 Sir Oliver Lodge.
7 Map showing stations.
8 Masts in a pineapple field.
9 Honolulu Station from the sea.
10 " Anchorage for steys.
11 " Anchorage. Near View.
12 Damped and Continuous waves.
13 A Valve.
14 Alternator.
15 Duddell Singing Arc.
16 Static Curves.
17 Duddell Arc.
18 Dynamic Curve.
19 Prof. Duddell.
20 Dr. Valdemar Poulsen.
21 System of Connection.
22 Small sized Poulsen Arc Generator.
23 An Anode.
24 Cathode Mounting.
25 System of Connection.
26 Steel Tower.
27 Elwell Wooden Tower.
28 Six Short Wooden Towers.
29 Method of Constructing.
30 Two Short Towers.
31 Stay Wires.
32 Oregon Station.
33 Admiralty Station, Hornsea Island.
34 Seaplane in collision at Hornsea Island.
35 Interior of Long Distance Station.
36 Tallest Wooden Towers in existence.
37 Base of Tower.
38 Electrical Machines.
39 Magnetic Circuits.
40 Method of Setting.
41 Interior of Arc Transmitter Room.
42 Map showing Stations.
43 Wireless Army Wagon.
44 " " " Near View.
45 " " " Pack Set.
46 " " " Trench set.
47 Using a set in the Trenches.
The following may be used with extra condensed notes instead of Nos. 21 and 24.
48 Elwell Poulsen Arc Installation.
49 System of Connection.
50 Small sized Arc Ganerator.
51 An Anode.
52 Cathode Mounting.
53 Small Arc.
54 Large Arc.

L WIRELESS TELEGRAPHY.

These Slides are published by the kind permission of the late Sir W. H. Preece and Sir Oliver J. Lodge; and those of the Marconi system and installations have been photographed with the kind assistance of the Wireless Telegraph and Signal Company. Notes on this subject, Nos. 1-28, can be obtained from Messrs. NEWTON.

Beautifully Painted Views, 7s. 6d. each.
" " *Portraits, 10s. each.* } *Plain Slides, 2s. each.*

1 Prof. H. Hertz. Portrait with Autograph
2 Standard Hertz Resonator
3 Prof. Oliver J. Lodge, D.Sc., F.R.S., &c. Portrait
4 Syntonic Leyden Jar Experimant
5 Spiral Wire Coherer
6 Diagram of Lodge's Experiments with Receiver [illegible] enclosed in Metal
7 External view of Lodge's proposed Syntonic [illegible] Signalling Station
8 Lodge's Single-point Coherer and Diagrams of Coherer Circuits
9 Lodge's and Muirhead's Improvements in Syntonic Telegraphy, shewing all connections for a complete station
10 Sir W. H. Preece, [illegible].B., F.R.S., &c. Portrait
11 [illegible] of apparatus for magnetic induction [illegible] principle of Preece's system as adopted by the Post Office
12 Lodge's Magnifying Telephone Devices showing detail of magnet and microphonic relay
13 Complete arrangement of Lodge's Magnifying Telephones in series
14 Signor Marconi. Portrait
15 Marconi's Short-distance Apparatus
16 Marconi's Receiver and Transmitter
17 Receiving Apparatus with cover removed
18 Wireless Telegraph Station at the South Foreland Lighthouse
19 The Marconi Transmitter in the Lighthouse connected for telegraphing to Wimereux
20 The Receiving Apparatus at the Lighthouse connected up
21 The mast carrying the vertical wire at the South Foreland
22 Receiving a message at the South Foreland
23 The mast at the Wimereux station [station
24 Receiving a message from Dover at Wimereux
25 Facsimile and transcription of Dot and Dash Message sent by H.M. the Queen from Dover to Wimereux to the Mayor of Boulogne

WIRELESS TELEGRAPHY—*Continued.*

26 Morse Printer
27 Morse Alphabet
28 Diagram showing Steady Flow of Energy
29 Portrait of Signor Marconi, taken at Poldhu
30 " " " on edge of cliff at Poldhu
31 Signor Marconi at work
32 " " on one of the Towers at Poldhu
33 Wireless Telegraphy station at Poldhu
34 The Wireless Guidance of Torpedoes by Electric Waves (The Orling-Armstrong Torpedo)
35 Wireless Telegraphy at Sea. The Italian ship "Casio Alberto"
36 The Marconi Transmitter at Work
37 A Cruiser communicating with Squadron by Wireless Telegraphy
38 Old Semaphore Signalling by hand. From London to Portsmouth in the days of Nelson.
39 Old Semaphore Signalling by hand. Diagrams showing methods of working.
40 International Morse Code.

G.P.O. Wireless Station, Rugby (Nos. 41-52)

41 General view from top of mast.
42 General view of all Masts.
43 View from Road.
44 Mast in course of erection.
45 Anchor and stays.
46 General view of Power House.
47 Motor Generator Room.
48 Motor Dynamo Room Interior (South East).
49 " " " (North East).
50 Condenser Room.
51 Valve Cabinet (open).
52 Tractor and Plough at work laying land wires.

For a set of Slides with Reading on "The Construction of Induction Coils" see "Industries," Section 7 of this Catalogue.

A set of Slides taken in an Electric Generating Station will also be found in Section 7. Slides on Electricity will be found on pages 111, 113, and 119.

B Y B TELEVISION—ITS HISTORY AND DEVELOPMENTS.

The following new series of Slides has been arranged by T. Thorne Baker, Esq., F.R.P.S., F.Inst.P.

Brief Typed Notes can be supplied, price 2s.

Plain Slides, 2s. 6d. each.

1 Korn Selenium Transmitter.
2 Selenium Cell made by Giltey.
3 Professor Korn.
4 The Reception of a Picture.
5 First photograph transmitted by the Koro System from Paris to London in November, 1907.
6 News picture wired from Paris to London by Korn's Selenium Appasetus.
7 Diagram of Method of Synchronising transmitting and receiving drums.
8 The Frequency Meter.
9 A picture transmitted by Koro's Telectrograph from Paris to London.
10 Example of Fashion Picture (1908).
11 Relief Method of Transmission.
12 Tschorner's Relief Syetem.
13 Picture transmitted by Belin's Telectrograph.
14 Writing in relief transmitted in facsimile by Belin's System.
15 The Code Method.
16 Photograph transmitted by the Bast Lane System.
17 Diagram of the Casell Transmitter.
18 Half-tone picture telegraphed by the Thorne-Behar System.
19 First photograph telegraphed from Manchester to London by the Thorne-Baker System.
20 System of reception of Rignoux and Fournier.
21 First half-tone picture sent by wireless in 1920.
22 The latest type of Picture Telegraph machine.
23 Example of beautiful work by the Bell System.
24 News Photograph transmitted by the Bell System.
25 Much magnified image showing the formation of the photographically recorded lines which vary in width.
26 Picture (greatly magnified) received by Bell Telephone System.
27 First photograph telegraphed in natural colours.
28 General scheme of Television.
29 Television image as transmitted by the mosaic method.
30 Image of head and shoulders photographed on the viewing screen of Mihaly's Television Apparatus.
31 Baird's Scheme of Television.
32 Mr. Francis Jenkins with his Television receiver.
33 The Belin System of Television.
34 Belin's Television Receiver.

U ELECTRICAL DISCHARGES.

Direct Photographs of actual discharges, some of which are from photographs by A. A. C. Swinton, Esq.

Plain Slides, 2s. each.

1 Ordinary oscilletory discharge from Induction Coil
2 High frequency oscilletory discharge from a Tesla Coil
3 Positive discharge from Induction Coil
4 Positive discharge from Induction Coil
5 Negative discharge from Induction Coil
6 Negative discharge from Induction Coil
7 Hand electrified by a Tesla Coil discharging on to glass plate
8 Electrified Penny
9 Single Flash Discharge from large Induction Coil.
10 Single Flash Discharge from large Induction Coil, the Spark Gap being within the Magnetic Field set up by the Coil itself. The Spark forms a complete helix between the electrodes.
11 Same as 10 (nearer view).
12 Pocket Book struck by lightning while in a man's pocket.
13 A halfpenny split in half and curiously marked by lightning, while in a man's pocket.
14 Spark Electrograph (February, 1905). 2s. 3d
18 Electric Discharges. Simultaneous discharge from both poles, showing characteristic figure attached to each. Photo by Mr. K. J. Tarrant.
18 High Frequency Discharge between Two Base Conductors. Photo by Mr. K. J. Tarrant (June, 1906). 2s. 3d.

See also Lightning Flashes, page 91.

R W

THE MAGNETIC FIELD.

A Series of Direct Photographs showing the Lines of Force in the Magnetic Field.

Plain Slides, 2s. each.

1 Arrangement about a horse-shoe magnet
2 " " " with Keifer
3 " " the two similar poles of two bar magnets
4 " " the two dissimilar poles of two bar magnets
5 " " the three similar poles of three bar magnets
6 " " two like poles and one unlike pole of three bar magnets
7 Arrangement about two parallel bar magnets with their dissimilar poles adjacent
8 " " one pole of a bar magnet
9 " " a single bar magnet
10 " " two parallel bar magnets with their similar poles adjacent

For other Slides on Magnetic Curves, see page 117.

B F Z

"X" RAYS AND THEIR APPLICATIONS.

The collection of slides detailed below will serve to illustrate the many sided and important present-day applications of X-rays to the arts and industries. Some of these applications were associated with the war, more particularly in the examination of materials and structures. Other applications are concerned more especially with peace industries.

The method of X-ray inspection has the great advantage of not injuring a body in any way. Furthermore, it provides in many cases the only means of detecting concealed defects in a material or of scrutinising in a structure the accuracy of assembly of component parts which are hidden from view.

An examination of the list will explain the interest which the subject has been found to possess for almost any audience. The illustrations are drawn from a variety of subjects ranging from Aircraft Materials and Structures to Old Masters, Flowers, Welds, Tyres, Finger Prints, Golf Balls, etc.

X-rays are now known to be light waves of extremely short wave-length, and an example will be found among the slides of X-ray spectra showing complete resemblance to ordinary light spectra.

For further information reference may be made to "X-RAYS," by Dr. G. W. C. Kaye (Longmans).

Plain Slides, 3s. 6d. each.

1 Two radiographs of the hand showing the immense improvements in radiography since the discovery of X-rays.
(a) By Mr. Campbell Swinton, F.R.S., in 1896, exposure 20 minutes.
(b) By Dr. R. Knox in 1920, exposure 1-100 second.
2 X-ray spectra of platinum, copper and lead at different exciting voltages showing spectral lines and quantum limit. (Muller.)
3 Radiograph of hand of mummy of Egyptian Princess, 4,500 B.C. (Knox).
4 X-ray photograph of finger prints (H. Beclere).
5 Radiograph of arm inside an artificial arm of aluminium alloy. (B.T.H.)
6 Artificial teeth showing construction and defects.
7 Radiograph of Flowers—carnations and ferns, etc. (Knox.)
8 Radiograph of Flowers—roses, etc. (Knox.)
9 Aeroplane pilot's Electrically heated jacket showing break in heating element.
10 Motor tyre, showing burst.
11 Aeroplane landing wheel tyre.
12 Corded motor tyre.
13 Dunlop magnum tyre partly dissected (Dunlop Rubber Co.)
14 Perfect and imperfect golf ball.
15 High tension electric cable, showing defects.
16 Defective electric weld in steel plate.
17 Defective oxy-acetylene weld in ½ in. steel plate.
18 Concealed crack in aluminium piston of aeroplane engine.
19 Defective soldering on part of petrol tank of aeroplane engine.
20 Tumbler-switch taken through cover.
21 Watch, showing works and detail of thickness of wheels.
22 Electrically heated coffee-pot.
23 Silver spruce and West Virginia spruce used in aeroplane construction.
24 Silver spruce showing also aluminium washer and steel wiring plate.
25 Silver spruce showing concealed grub holes and remains of grubs.
26 Mill-plywood used in aeroplane construction showing defects.
27 Laminated spar showing large concealed grub hole.
28 Laminated spar showing concealed knots and grub holes.
29 Built up aeroplane spar showing poor workmanship.
30 Built-up aeroplane spar showing poor workmanship.
31 Aeroplane spar of box type, showing forbidden joints in ply-wood side.
32 Box-spar showing badly shaped end-block split by screws.
33 Aeroplane strut not "bottoming" into its aluminium sockets.

X-RAYS AND OLD MASTERS.

34 St. Jana "Madonna." (1500) and radiograph revealing the Child in the arms of the Madonna (Heilbron).
35 & 36 Engelbrechten's "Crucifixion," showing alteration detected by X-rays, and subsequent restoration of picture completely verifying radiograph. (Heilbron).

For Slides of X-ray Photography in Medical work, see "Health," Section 1 of this Catalogue.

For other X-ray Slides see "Industries and Manufactures" Section 7 of this Catalogue.

UT BRIGHT-LINE SPECTRA.

The following special slides were designed to show on the screen the bright-line spectra *in correct colours* of the various gases and metals. They were first made for the late Prof. Sir William Ramsay to illustrate his lecture before the British Association.

We are anxious to acknowledge the kindness of the late Prof. Sir WILLIAM RAMSAY, F.R.S., &c., who, in spite of the great demands on his most valuable time, with his usual courtesy, most kindly assisted us in the production of these Slides. These can only be shown in conjunction with No. 1 of this series, which is used *with* each of the others in turn.

Price, No. 1, 10s.; all the remainder 5s. each.

1 Spectrum slide, coloured, to be placed in an ordinary single lantern *with* any of the following:—
2 Helium Line Spectrum
3 Argon " "
4 Neon Line Spectrum
5 Krypton " "
6 Xenon " "
7 Hydrogen " "
8 Oxygen " "
9 Nitrogen " "
10 Calcium Line Spectrum
11 Strontium " "
12 Beryium " "
13 Iodium " "
14 Natrium " "
15 Lithium " "
16 Kalium Line Spectrum
17 Rubidium " "
18 Casium " "
19 Titen " "
20 Radium " "
21 Emanations of Radium

The above series of Slides on Bright-Line Spectra was so well received and proved so useful that, by the request of some of our customers, we went to considerable trouble and expense to add the characteristic spectra of 33 more substances.

22 Air.
23 Aluminium.
24 Ammonia.
25 Arsenic.
26 Bismuth.
27 Bromine.
28 Calcium Chloride.
29 Carbon.
30 Carbon Hydride.
31 Carbon Oxide.
32 Chlorine.
33 Chlorophyll.
34 Copper.
35 Cyanogen.
36 Gold.
37 Iodine.
38 Iron.
39 Lead.
40 Magnesium.
41 Manganese.
42 Mercury
43 Nickel.
44 Oxide of Nitrogen.
45 Phosphorus.
46 Platinum.
47 Silicon.
48 Silver.
49 Sulphur.
50 Thorium.
51 Tin.
52 Uranium.
53 Water.
54 Zinc.

See also page 125

AFK REFRACTION OF LIGHT.

Plain Slides, 2s. 6d. each.

1 Photograph of Mirage on hot City Pavement
2 Light Ray travelling in line curve in non-homogeneous medium
Parallel Bundle of Rays coming to successive foci in non-homogeneous medium

AFL ANOMALOUS DISPERSION OF SODIUM VAPOUR.

1 Sodium Flame (Coloured), 5s.
2 Spectrum given by prism of Sodium Vapour crossed with a glass prism (coloured), 5s.
3 Spectrum given by prism of Sodium Vapour crossed by diffraction grating, 2s. 6d.

O OPTICAL PHENOMENA.

A new series of Slides from negatives made direct from the actual objects, by Mr. W. B. CROFT, of Winchester College.

Plain Slides, 2s. 3d. each; Beautifully Painted, 5s. to 11s. each.

1 Fresnel's interference from a Bi-prism.
2 Two very narrow slits: the broader has narrower bands.
3 Diffraction. Four small circular holes: a different phenomenon from that of the very narrow openings.
4 Diffraction. Arago's bright centre to the shadow of opaque circular screen.
5 " " " "
6 Diffraction of 6d. piece. Arago's bright centre.
7 Diffraction. Needle points: the smaller needle has the larger bright centre.
8 Diffraction. Eye of Needle.
9 " "
10 Diffraction: Wire Gauze.
11 Diffraction. Perforated Zinc: to show the bands in the shadow.
12 Diffraction. Perforated Zinc: to show the bands in the spaces.
13 Arago's shiftings of bands: the velocity in glass less than air.
14 Groups of circles for diffraction screens; much magnified: the original figures are about $\frac{1}{10}$th inch diameter: a part of Bridge's series.
15 Fraunhofer or Schwerd diffraction from three of these figures.
16 " " "
17 " " "
18 Fresnel diffraction from these figures.
19 " "
20 " "
21 " "
22 Talbot's bands: glass film an object glass.
23 Talbot's bands: glass film an eye piece.
24 Conical refraction. Five examples of the phenomenon from five pin-holes of light.
25 A Model of the wave-surface.
26 Calcite in polarised light: rings and brushes.
27 Calcite circularly polarised and circularly analysed.
28 Calcite. The dislocated rings of a negative crystal.
29 Concave Selenite: rings in polarised light.
30 Quartz: rings and brushes.
31 The two spirals of right-handed quartz.
32 Quartz. Airy's spirals, right and left quartz.
33 Quartz. Shifting hyperbolæ.
34 " " another position.
35 Quartz. Savart's Bands.
36 Babinet's Compensator.
37 Nitre: rings and brushes.
38 " " another position.
39 Nitre: circularly polarised.
40 " " another portion.
41 Nitre: circularly polarised: Lewis Wright's Spirals.
42 Bertrand's Idiocyclophanous prism of calcite.
43 " " another position.
44 Idiocyclophanous Topaz.
45 Unannealed Glass to polarised light.
46 " "
47 Annealed Glass under pressure.
48 Newton's Rings: reflected.
49 " transmitted.
50 " reflected: on a larger scale.
51 Rings of Tubular calcite
52 " " four positions.
53 " "
54 " "
55 Star of twenty-four rays: internal reflection in Canada mica or Phlogopite.
56 Micro-photograph showing the internal crystals of the mica.
57 *The Human Eye.* Back part of human eye: showing nerve trunk and fibres and punctum cæcum
58 " Crystalline lens of human eye.
59 " The lens more highly magnified to show onion structure.
60 " The human retina, showing numerous layers.
61 " The human retina: to show more distinctly the rods and cones

See also "Industries," Section 7 of this Catalogue.

PHOTOGRAPHS OF EXPERIMENTS WITH LIGHT RAYS.

BIM REFLECTION IN MIRRORS, REFRACTION BY LENSES, ETC.

By Dr. H. J. OOSTING.

Plain Slides, 2s. 6d. each.

These Slides, like those in the above set (Q), are photographed direct from the apparatus used in the experiment, and give a far better idea than a mere diagram. They are really almost essential where apparatus is not available.

Nos. 1 to 16—REFLECTION.

1 Plane Mirror.
2 Concave Spherical Mirror.—Luminous point in the centre of curvature.
3 Slightly turned.
4 Incident Rays parallel.
5 Slightly turned. Incident rays parallel.
6 Luminous point coinciding with principal focus.
7 " " " " mirror turned.
8 Luminous point at a distance greater than the radius.
9 Luminous point at a smaller distance.
10 Luminous point at a distance smaller then the local length.
11 In convex spherical mirror. Incident rays parallel.
12 Luminous point on axis of mirror.
13 Light rays passing surface of separation between air and water.
14 Light rays passing through glass cell filled with water.
15 Light rays passing through glass cell filled with Carbon Bi-sulphide.
16 Total reflection on surface between water and air.

Nos. 17 to 25—REFRACTION.

17 Parallel rays by a convex lens.
18 Rays by a coovex lens. Luminous point in principal locus.
19 Luminous point in principal axis at a distance twice the local length.
20 Luminous point at a distance twice the focal length but not in principal axis.
21 At a distance from lens greater than twice the focal length.
23 Luminous point at a distance greater than one and smaller than twice the focal length.
23 Luminous point at a distance smaller than the local length.
24 Rays through Concave Lens. Incident Rays parallel.
25 Luminous point on principal axis.
26 Course of Rays in Astronomical Telescope.
27 " " " " "
28 " " " Dutch or Galilean Telescope
29 " " " " " "
30 " " through objective of Lantern.
31 Spherical Aberration.

ARH POLARIZED LIGHT.

These Slides are taken by means of three-colour photography, direct from the object under Polarized Light. The brilliant colours shown in the originals are as nearly as possible reproduced in the Slides. They are very transparent, and can be shown in conjunction with other slides.

They were taken by the late T. E. FRESHWATER, F.R.P.S. The Slides should be very useful to the lecturer who wants to produce the effect of polarized light without the trouble of working the Polariscope.

Price 10*s.* 6*d. each.*

BLOCKS OF CHILLED OR UNANNEALED GLASS OF VARIOUS SHAPES.

Showing the permanent polarizing structure of glass that has been uniformly heated and suddenly cooled.

1 Star on dark field.
2 Star on light field.
3 Two bars of glass crossed.
4 Cube, showing red spots with blue eyes.
5 Oval, cross and colour rings.
6 Circle, cross and colour rings.
7 Triangle. This shows very curious markings.
8 Rose. Very pretty object.
9 Square, &c., &c.
All the above show the black cross and colour bands.

QUARTZ PLATES.

10 Natural right-hand Compound, very fine, showing the formation of the Crystal.
11 Bi-quartz, right and left-hand, built up.
12 Quartz, showing cross crystallization, whole section of crystal.
13 Bar of crystal, very pretty.
14 Bi-quartz put together at 45 degrees.
15 Plate showing formation of a twin crystal.

SELENITES.

16 Wedge showing bands of colour.
17 Double wedge crossed.
18 Concave, worked to shew Newton's Rings, on dark field.
19 Concave, worked to show Newton's Rings, on light field, showing the complementary colour to the one on dark field.
20 Plate of uneven film.
21 Plate showing mucle.
22 Amethyst, section of, in plane polarized light.
23 Amethyst with red and green selenite superposed.
24 Granite.
Various rock sections in course of preparation

AGZ LANTERN SLIDES BY DIRECT COLOUR PHOTOGRAPHY.

These are made to illustrate three-colour photography by various processes.

Price 10*s.* to 12*s.* 6*d. each.*

1 Early morning in spring.
2 Autumn, Richmond Park.
3 Pines, Chobham, Surrey.
4 Autumn, Chobham, Surrey.
5 Collection of British Fungi.
6 River Inver, Scotland.
7 Lane in autumn.
8 Sunset. (Mackerel sky.)
9 Sunset. (River Thames at Kew Bridge.)
10 Chrysanthemums.
11 Tulips.
12 Silver birches. (Burnham Beeches.)
13 Daffodils. (Kew Gardens.)
14 Rhododendrons. (Kew Gardens.)
15 Pond at Putney Heath.
16 Apple tree in bloom.
17 Apple Blossom
18 Apples, Basket of.
19 Cherries on branch.
20 Strawberries on leaf.
21 Fuchsia.
22 Daffodils.
23 A Rose.
24 Bowl of Roses.
25 Bunch of Roses.
26 Rambler Rose. (Dorothy Perkins.)
27 Butterflies. Red Admiral.
28 " Painted Lady, Peacock, Clouded Yellow.
29 " Kallima Iadia, and wings with leaf to show Insect Mimicry.
30 Death's Head Moth.
31 Mason Bee, Life History of.
32 Whalebone. Transverse Section, polarized light.

BYS NATURAL COLOUR PHOTOGRAPHY.

Price 10*s.* 6*d. each Slide.*

Messrs. NEWTON have pleasure in announcing the publication of a new series of Natural Colour Slides.

A full list of the subjects will be sent on application.

A special selection of 50 Slides will be sent on loan at a hiring fee of £1 1s. 0d.

XS PHOTOCHROMOSCOPE SLIDES.

Slides, photographed for use with the Photochromoscope, showing the principles of three-colour photography.

Sets of Three Pictures in wood frame, 10*s.* 6*d. the set.*

Messrs. NEWTON are prepared to make Negatives and Slides by the various colour processes, such as the Autochrome, Paget, Sanger Shepherd, Agfa, Duplex, &c.

PHOTOGRAPHING BY ULTRA-VIOLET AND INFRA-RED RAYS.

AKQ

These Slides were made from negatives prepared by Prof. R. W. Woon, of the John Hopkins University to illnstrate his Lecture on "Photographing by Invisible Light."

Plain Slides, 3*s. each.*

Printed Reading, 2*s.*

1 Spectrum. (Fainted, 10s.)
2 Sky and White Paper by Infra-Red and Ultra-Violet Light
3 Trees at Florence by Infra-Red Rays
4 Willow Tree, Florence
5 Umbrella Pines at Roma
6 Mount Etna from Taormina, by Infra-Red Rays
7 Florence. An Old House, " "
8 " Trees in the Park, " "
9 " Cypress Trees, " "
10 " A Corner of the Park, " "
11 " View of the Country near, " "
12 " A Shady Corner in the Park, " "
13 " A Typical Italian Road, " "
14 " A Road leading to Florence, by " "
15 " On Mount Oliveto " "
16 " Certosa Monastery " "
17 " A View from behind San Miniato " "
18 " Old Church, " "
19 On the Road to Fiesole, " "
20 A Ruined House at Pompeii, by ordinary light
21 Hadrian Villa, Odana, " "
22 A Grove of Pine Trees near Roma, by Infra-Red Rays
23 Old Temple, Girgenti, " "
24 Straits of Messina from Taormina, " "
25 A Greek Theatre, Taormina, " "
26 Palermo View looking towards Monte Pellegrino, " "
27 " View, Monte Pellegrino, by " "
28 Palermo. Cactus and Palms, by Infra-Red Rays.
29 Syracuse. River Scene with Papyrus, " "
30 " Almond Trees in Catomia, " "
31 " The Quarry, Catomia, " "
32 The Quarry, Catomia, " "
33 The Shadowless Man
34 Landscape seen through Window, by Ultra-Violet and Visible Rays
35 White Flowers, by Ultra-Violet and Visible Rays
36 Bunch of White Flowers, by Visible and Ultra-Violet Rays
37 Reflections from a Mirror by Ultra-Violet and Visible Rays
38 Reflections from Silver and Brass in Ultra-Violet Rays
39 Glass Jar and Silver Jug, by Visible and Ultra-Violet Rays
40 Nickel and Silver Reflecting Surfaces, by Visible and Ultra-Violet Rays
41 Letters in Chinese White, photographed by Ultra-Violet and Visible Light
42 Lunar Photographic Telescope on Bicycle Frame
43 Lunar Photographs by Ultra-Violet and Yellow-Light
44 Various Substances by Ultra-Violet and Yellow Light
45 Invisible Ray surrounding an Electric Spark; photographed by Ultra-Violet Light
46 Absorption of Ultra-Violet Light by a Candle-flame
47 Iron Spectrum from Nickel and Silver Mirrors

For Slides on Ultra-Violet Treatment, see "Health," Section 1, of this Catalogue.

ON

STEREOSCOPIC PICTURES.

SHOWN WITH THE LANTERN BY THE "NEWTONIAN" SYSTEM.

After a considerable amount of experiment, Messrs. NEWTON have arranged a very successful system of showing slides *stereoscopically* with any ordinary Biunial or other dissolving lanterns. The details of the pictures stand out with wonderful stereoscopic effect, obtained by using an ordinary pair of glass stereoscopic pictures, showing one in each lantern, one through a green and the other through a red glass. These colours are very carefully selected, so that the green cuts practically all the red light out of the spectrum, and the red in the same way cuts out the green.

One picture is to be put in each Lantern and there are thus two pictures on the screen, one red and one green, and when the observer looks through a pair of spectacles having one glass green and the other red he sees one picture only with each eye. With the right eye he sees only the right-hand picture, and with the other only the left-hand picture, and these being superimposed on the screen give the usual effects of stereoscopic vision.

No alteration whatever need be made in the Lantern, and the Slides will fit any ordinary carriers. The pictures should not be shown more than eight feet in diameter with limelight.

A large selection of pictures bound up with red and green glasses, per pair... 5s. 6d.

Hand frames containing red and green glasses for looking through to observe the pictures, per pair ... ... 3s. 6d.

Selection of 24 slides and spectacles can be sent on loan. Hiring fee ... 15s. 0d.

NOTICE.

Messrs. NEWTON & CO., LTD., beg to announce that all the Lantern Slides published in this catalogue are strictly copyright.

The Royalties due in every case are included in the prices quoted, the payment of which confers on the purchaser the right of exhibiting these Slides anywhere in public or in private, but on no account must the pictures be copied either on paper or glass, or in any other way.

AGY STEREOSCOPIC LANTERN SLIDES FOR PROJECTION WITH A SINGLE LANTERN.

These Stereoscopic Photographic Slides, printed in red and green, when looked at through a pair of coloured spectacles, give a wonderful Stereoscopic effect. The photographs are taken with two lenses, just as in the case of ordinary Stereoscopic pictures, but printed mechanically in green and red.

		s.	d.
Lantern Slides for use with a single lantern	each	4	6
Plain Selectors, red and green	,,	1	0

AKR MARVELS OF MODERN PHOTOGRAPHY

This Series brings the Science of Photography up to date, but it is arranged, and the lecture has been written, to suit a popular audience.

A glance at the list of subjects will show the comprehensive nature of this set, and while it is purposely kept on such a plane as to interest and amuse an ordinary audience, it may safely be concluded that there will not be one man present to whom some point or other will not be new.

Prices as marked.

Lecture, 2s.

1 Art in Photography. 2s.
2 Landscape—Summer. 2s.
3 Landscape—Winter. 2s.
4 Crowned Pigeon. 2s.
5 Young Zebra. 2s.
6 Frilled Lizard running. 2s. 9d.
7 Architectural detail. 2s.
8 Mrs. Siddons, by Gainsborough. 2s.
9 Vase of Flowers on ordinary photographic plate. 2s.
10 Vase of Flowers, orthochromatic. 2s.
11 Wave Study. 2s. 6d.
12 An artist's conception of a Galloping Horse. 2s.
13 A Close Finish. 2s. 6d.
14 Horses going uphill. From the Louterell Psalter. 2s. 3d.
15 Queen Philippa and the Citizens of Calais. 2s. 6d.
16 Queen Victoria at St. Paul's, at the Diamond Jubilee. 2s.
17 George V. in Westminster Abbey. The only photograph ever taken of an English Coronation. 2s. 6d.
18 Pharoah Rameses II (Head of). 2s.
19 Bacillus Anthracis. 2s. 6d.
20 Bacillus Tuberculosis. 2s. 6d.
21 Zygotes in stomach of Mosquito. 2s. 6d.
22 Filaria in proboscis of Mosquito. 2s. 6d.
23 Nitrifying organisms in soil. 2s.
24 Photographing from howsprit. 2s. 6d.
25 Photographing under water. 2s.
26 Living Corals with extended Polyps. 3s.
27 Photographing under difficulties. 3s.
28 Purple Heron photographing itself. 2s. 9d.
29 A Flash of Lightning. 2s. 6d.
30 High Frequency Oscillating Electric Discharge. 2s.
31 Electrified Human Hand. 2s.
32 Positive discharge from Induction Coil. 2s.
33 Negative discharge from Induction Coil. 2s.
34 Rotating form of Spark from Induction Coil. 2s.
35 Flying Bullet, showing Air Waves. 3s. 6d.
36 Rifle Bullet striking Plate Glass. 3s. 6d.
37 Rifle Bullet passing through Plate Glass. 3s. 6d.
38 Bullet after passing through Glass Plate. 3s. 6d.
39 Bullet clear of Glass Plate. 3s. 6d.
40 Exposure scale. Millionths of a second. 3s. 6d.
41 Photograph of an Echo. Sound-wave reflected from plane mirror. 2s. 6d.
42 Visual formation of a musical note. 2s. 6d.
43 The Pleiades Telescopic View. 2s. 6d.
44 ,, Photographic View. 2s. 6d.
45 ,, Prolonged exposure showing nebulae. 2s. 6d.
46 ,, Astrographic Chart. 2s. 6d.
47 Millions of Stars. 2s. 6d.
48 Nova Persei. Photographed by light rays 300 years old. 2s. 3d.
49 Pin-hole Photograph. 2s.
50 Across the River. 2s.
51 Across the River. Telephoto. 2s.
52 Kittiwake leaving nest. Telephoto. 2s. 6d.
53 Telegraphing a picture. 2s. 6d.
54 Moving pictures. 2s.
55 Head of a Crane Fly. 2s.
56 Eye of Beetle. 2s. 6d.
57 Snow Mushroom. 2s. 6d.
58 Photograph of Snow Crystal. 2s. 6d.
59 Scene from a balloon. 2s.
60 Rainbow in the spray of Victoria Falls. 2s.
61 St. Paul's Cathedral in Venice. 2s. 6d.
62 The Grand Canal in Regent Street. 2s. 6d.
63 Distortion or True Perspective. 2s.
64 Solar Spectrum. 2s. 6d.
65 Photography by Invisible Infra-Red Rays. 3s.
66 Photography by Invisible Ultra Violet Rays. 3s.
67 Photography by Invisible Radium Rays. 3s.
68 Photography by Invisible X-rays. 2s.
68 Photography by Invisible X-Rays, Instantaneous. 2s.
70 Colour Photography, Autochrome. 10s. 6d.
71 Three-colour photography. Sanker Shepherd. 25s.
72 Photography and Colour. 6s.

Messrs. NEWTON & CO., LTD., have prepared specially selected sets of slides for Hire for Entertainment purposes.

The selections include Fairy Stories, etc., illustrated by Leslie Brooke, Caldecott, H. M. Brock, Greenway, Lawson Wood, and others; also examples from famous Galleries, Bird and Animal Studies, and carefully chosen miscellaneous and humorous slides.

All the pictures are of high quality and in good taste, and Messrs. NEWTON will be glad to forward particulars of the slides and readings in each set.

When making application kindly state average age of children.

WT

THE FALL OF A WATER DROP

Plain Slides, 9s. the Set of Four.

1 Jet of Water falling freely in the air.
2 " " broken up by a blow on Supporting Stand
3 Jet of Water before and after Application of a Vibrating Tuning Fork to the Support
4 Portions of Water Jet under the Influence of Vibrating Fork

PHOTOGRAPHS OF RIPPLES.

By Dr. J. H. VINCENT.

Illustrating acoustical and optical phenomena by photographs of ripples on the surface of mercury and water.

Messrs. Newton & Co. have the sole right of reproduction of these negatives.

Plain Photographs, 2s. 6d. each.

TK

RIPPLES ON MERCURY.

A. Illustrating Paper in "Philosophical Magazine," June, 1897.

1a Interference. Two point sources same phase. The straight lines are those of minimum disturbance: they are hyperboles of which the centres of disturbance are the foci
2a Interference, showing confocal hyperboles and ellipses, the latter being the light oval curves in the centre
3a Interference to illustrate Moslin's experiments
4a Beats. The curved light lines of minimum disturbance rotate towards their convexities
5a Two sets of ripples propagated isochronously, one four times as rapid as the other
6a One point source and a reflecting line producing Lloyd's bands
7a Virtual image in plane rectilinear reflector
8a Virtual image in concave reflector
9a Spherical aberration in concave mirror
10a Virtual image in convex reflector, showing interference fringes
11a Plane rectilinear waves brought to a focus in concave reflector, showing two series of parabolic interference fringes
12a Reflection of plane (linear) waves in a plane (linear) reflector, showing diffraction

TL

RIPPLES ON MERCURY.

B. "Philosophical Magazine," February, 1898.

1b Ripples due to agitation of support of mercury trough by a musical note
2b Ripples due to agitation of support of mercury trough by noise
3b Point source and its image at equal distances from concave reflector, showing conjugate foci
4b Real image of point source in a concave reflector, showing normal and abnormal foci
5b Spurious ripple focus
6b Conjugate foci of ellipse
7b Source at centre of ellipse, showing two foci conjugate to the centre near each end of ellipse
8b Plane diffraction grating effect produced by ten equidistant sources
9b Analogous to a zone plate in optics
10b Ripples caused by a card cut to represent a median section of a circular zone plate. This and No. 8b illustrate the fact that the focal length of a zone plate is less for red than for blue light
11b Refraction in a prism
12b Refraction in three circular patches of mercury covered with water

TM

RIPPLES ON MERCURY.

C. "Philosophical Magazine," September, 1898.

1c Doppler's principle
2c Waves formed by motion of a style along the surface of the mercury
3c Interference between two sources of nearly the same frequency, 190 and 170
4c, 5c, 6c To get wide interference bands in optics, the two point sources must be near together. The sources in these photographs vibrate in opposite phase. The bright lines of minimum disturbance decrease in number as the sources approach each other until in No. 6c only the centre band is left
7c Young's experiment
8c Arago's experiment to test Newton's emission theory
9c Rowland's concave grating 10 sources, frequency 170
10c Interference pattern produced by three point sources vibrating in same phase
11c Ripples caused by impact of a shot
12c Ripples caused by a ricochet

TN

RIPPLES ON WATER SURFACE.

D. "Philosophical Magazine," October, 1899.

1d Refraction of plane (rectilinear) waves in a plane (rectilinear) surface
2d Refraction through a prism
3d Fringes analogous to those joined by a hi-prism caused by a glass cylinder just submerged, the waves being retarded in passing over the shallow portion.
4d, 5d Refraction in a medium of increasing optical density
6d Refraction of spherical (circular) waves in a plane (straight line), showing also Lloyd's bands due to reflection
7d Refraction of plane (rectilinear) waves in a lens
8d Refraction of spherical (circular) waves in a lens giving plane rectilinear waves

U.W WAVES OF WATER, SAND, AND SNOW.

The Study of Surface Waves and kindred forms of the Atmosphere, Hydrosphere and Lithosphere.

These Slides are from direct negatives by VAUGHAN CORNISH, D.Sc., F.G.S., F.C.S. F.R.G.S.

Plain Photographs, 2s. 6d. each. Descriptive notes by Dr. Vaughan Cornish, 9d.

A.—Drift Sand.

1 Symmetrical Ripple-Mark
2 Ripple-Mark
3 Unsymmetrical Ripple-Mark
4 Intersecting Ripple-Mark
5 Triple-crested Ripple-Mark
6 Current Mark
7 Tidal Sand Waves
8 " " "
9 " " "
10 Meanders at Low-Tide channels
11 Worm Casts and Ripple-Mark
12 Tidal Sand Waves
13 Intersecting tidal Sand Waves
14 Irregular Tidal Sand Waves
15 Pools left on obliteration of tidal sand wave
16 Æolian Sand Ripples
17 " " "
18 Æolian Sand Waves
19 " " "
20 Sand Drift
21 "
22 Pyramidal Sand Dune
23 Encroaching Sand
24 " "
25 Planting the Desert
26 Wind-formed rock-table
27 Wind-eroded cliff and talus
28 Water-erosion in the desert

B.—Drift Snow.

29 Moving Snow Waves
30 Ripples in Granular Snow
31 Snow Ripples and Snow Drift
32 Ripples in Gravel-like Snow
33 Ledges on lee side of Snow drift
34 Undulating erosion surface of Snow
35 Stratification of snow revealed by the action of wind
36 Commencement of a Snow Drift
37 Double Snow Drift
38 Incorophite Snow Drift
39 Snow Drift
40 Snow Drift, looking upward
41 Drift against a house on lee side
42 Horse-shoe Drift round house
43 Drift on lee side of house
44 Wind Hollow round Tree
45 "Eolites" in Snow
46 Drift Snow on smooth Ice
47 Drift Snow among Ice Hummocks

C.—Snow Mushrooms.

48 The Selkirks, B.C., from Glacier House
49 Mount Cheops
50 Mount Congar
51 Mount Congar and Snow bosses
52 Building with a "thatch" of snow 6ft thick
53 Snow Bosses
54 Three Snow Mushrooms
56 A "Button Mushroom"
56 The "Priest Mushroom"
57 Nine-foot Mushroom
58 Snow Capon Telegraph Pole
59 Twelve-foot Snow Mushroom
60 The "Twelve-footer" from below
61 Snowcap eroded by wind

D.—"Cahots," the Undulations produced by Sledges

62 "Cahots" in Montreal
63 Toboggan Waves
64 "Cahots" at Coniston
65 The Slate Sledge
66 Bringing down the Slates
67 The Bogey or "Paddock"
68 "Forced" Cahots
69 "Free" Cahots

E.—Water Waves.

70 Storm in the Atlantic
71 Storm in the Mediterranean
72 Storm at Eastbourne
73 Bursting Wave
74 Waves at low tide
75 Crossing Waves
76 Rippled Foam
77 Wave track of a Ship
78 Wave track of a Steamer in the Soos Canal
79 Wave track of model Battleship

F.—Wave Clouds.

80 Rippled Clouds.
81 The true aerial ripple mark

E.—Water Waves. *Additional Slides.*

83 Stationary Waves in Flowing Water on the Aare at Thun, Switzerland. These waves face no stream.
84 Roll Waves in the Conduit of the Grannbach at Meriigen, on the Lake of Thun. These waves travel down channel faster than the current flows. They face down stream.
85 Roll Waves, leaping the outfall of a conduit at Merligen, on the Lake of Thun.
86 Wave-track of a Ship, Lake of Thun, showing both the diverging and transverse waves.
87 The Wave-track of a Skip on the Lake of Geneva, showing both the diverging and the transverse waves.
88 Starboard. Heavy swell off coast of Portugal, Dec. 20th, 1911.
89 Starboard. Heavy swell off coast of Portugal, Dec. 20th, 1911.
90 S.S. Stiloe. Hove to in strong gale in Bay of Biscay, Dec. 20th, 1911.
91 Mast of S.S. Stiloe alone visible above crest of wave, storm in Bay of Biscay, Dec. 21st, 1911.
92 S.S. Mathilde hove to length 200 feet among waves of between 600 to 700 feet, Bay of Biscay, Dec. 21st, 1911.
93 Waves between 600 to 700 feet long, set going down, Dec. 21st, 1911.
94 S.S. Stiloe hove to, Bay of Biscay, waves more than 80 feet high, Dec. 21st, 1911.
95 Steamship Mathilde hove to, 228 feet long, length of waves between 600 and 700 feet, Bay of Biscay, Dec. 21st, 1911.

T FLYING BULLETS AND AIR WAVES.

A series of Twelve Lantern Slides, chiefly from Photographs taken by Prof. C. V. Boys, F.R.S.

Plain Slides, 3s. 6d. each, except Nos. 3, 4, 13. £2 2s. the set.

READING—Extracts from a Lecture by Prof. C. V. Boys, F.R.S., price 9d.

1 Bullet from Martini-Henry rifle travelling 1,298 feet per second [second, 2s.
2 Magazine rifle bullet, travelling 2,000 feet per
3 Diagram to explain cause of air waves produced by bullet.
4 Diagram to explain why the waves are visible, 2s.
5 Bullet passing through ether vapour and carbonic acid gas
6 Reflection of air waves caused by bullet from flat surfaces
7 Martin-Henry bullet, travelling 1,298 feet per second, disturbed by reflection of air waves from flat surfaces
8 Shot, 9obolte No. 6. Right barrel, showing air waves and wad
9 Magazine rifle bullet striking sheet of plate glass, showing back splash of glass dust
10 Bullet passing through plate glass
11 Bullet after passing through plate glass, surrounded by glass dust. Plate beginning to break up
12 Bullet clear from glass dust. Air waves caused by glass dust, and by piece of glass punched out by bullet
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Photographed from the Actual Figures made with Iron Filings, by Professor S. P. THOMPSON, D.Sc.

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462 Magnetic curves of horse shoe magnet.
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464 Curves of attraction of two magnets.
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5 Combustion of Turpentine and Antimony in Chlorine.
6 Reciprocal Combustion—Coal Gas and Air.
7 Reciprocal Combustion—Chlorine and Hydrogen
8 Ignition Point of Phosphorus.
9 Spontaneous Ignition of Phosphorus.
10 Spontaneous Ignition of Phosphorus.

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6 Conditions of Solubility of Ammonia by Water.
7 Conditions of Solubility of Ammonia by Water.
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10 Combustion of Ammonia.

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9 Identification of Carbon Monoxide.
10 Reducing action of Carbon Monoxide.

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1 July 15, 1907. Frank McClean ascending with Short from Battersea Gasometers. Descended Reigate. Beginning to fill.
2 In the Air.
3 Sunshine above the fog at an altitude of 6,000 ft. The top of the fog has the billowy nature of a Cumulus Cloud.
4 The Easter Ballooning Party at "The Hendre," Monmouth. "Satellite."
5 April 20. The "Satellite" ascending. Count Castillon (in charge), Hon. Claude Brabazon, Hon. C. S. Rolls.
6 The Visitors returning to the Station in Waggons.
7 The Balloons at Hurlingham. "Corona."
8 The Balloons at Hurlingham. "Cognac."
9 May 30. Leaving the "Mat."
10 The Start from the Battersea Gasometers at 4.56 p.m. Shadow of Balloon on Gasometer.
11 Hampton Court. 2,000 ft.
12 Views from the Car of the "Corona." The Guards encampment at Aldershot. 2,200 ft.
13 Buckingham Palace. 2,400 ft.
14 Tower Bridge. 2,300 ft.
15 The Tower of London. 2,300 ft.
16 The Neighbourhood of South Kensington. 6.26 p.m. 1,800 ft.
17 From the Albert Memorial, looking South. 6.27 p.m.
18 The Start at Battersea.
19 The Start at Battersea. A Pilot Balloon.
20 The Sea of Cloud below us. 8.35 p.m. 9,700 ft.
21 The Tate Gallery. 1.35 p.m. 2,400 ft.

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5 A Balloon ascent, view from balloon, showing landscape and shadow of balloon.
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12 Captive Military Balloon for observation.
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29 Aeroplane experiments, birdlike machine suspended on rough carriage, side view. 2s. 3d.
30 Aeroplane experiments, birdlike machine suspended on rough carriage, front view. 2s. 3d.
31 Wright's first Biplane Glide, first successful flight, 1905.
32 Curtis on a Wright Biplane in flight.
33 Santos Dumont with his "Bird of Prey" Machine
34 Farman on his Voisin Viplane in flight, winning £2,000 for Circular Kilometre.
35 Late Col. Cody, with his wife as passenger, in flight over Laffans plain.
36 Somner and Farman racing on their Biplanes.
37 De la Grange on Bleriot machine in flight.
38 Count Lambert racing at Rheims.
39 Latham on his birdlike Monoplane in flight.
40 Monoplane flying through the clouds.
41 Biplane in warfare. Coming to earth after reconnoitering.
42 Biplane in warfare. On ground.
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64 Major Maitland after landing.
65 Lieut. Dunne's V-shaped Biplane.
66 Late Col. Cody and Lieut. Parke.
67 Late Phillipe Marty in his Monoplane.
68 M. Salmet seated in his Monoplane.
69 Robert Slack and his Monoplane.
70 The Zeppelin Airship landing in France. French Soldiers holding down Airship.
71 The Zeppelin Airship landing in France. Stern View of Airship, showing steering gear, etc.
72 A French Speiss Dirigible.
73 Bulgarian Troops and their Observation Balloon.

AERIAL PHOTOGRAPHS.

We have a number of Slides made from negatives taken from Airships and Aeroplanes. Details will be found under Code B F M in "Geography," Section 5 of this Catalogue.

For other Slides on the Work of Aircraft, see Lecture Set under Code A Z Q in "History," Section 6 of this Catalogue. For Sets on "Aeroplanes," "Aviation, Commercial, Naval and Military," and "The Construction of the Handley-Page Aeroplane," see "Industries" Section 7 of this Catalogue.

CLOUDS.

From Original Negatives by W. J. S. Lockyer.

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1 Clouds. Feb. 20, 1906, at S.P.O.
2 Clouds. Thunder Cumuli. April 12, 1906.
3 Clouds. May 21, 1906, 1.30 p.m., at S.P.O.
4 Clouds. May 21, 1906, 1.30 p.m., at S.P.O.
5 Clouds. July 16, 1906, 3.45 p.m., at S.P.O.
6 Clouds. Mares Tails. July 24, 1906, 11.55 a.m., at S.P.O.
7 Clouds. Cirrus Cumulus. July 24, 1906, 12.5 p.m., at S.P.O.
8 Clouds. Cirrus in form of Mares Tails. Sept. 24, 1906, 3.45 a.m., at S.P.O.
9 Clouds. Alto Stratus. Oct. 23, 1906, 4.30 p.m., at S.P.O.
10 Clouds. Clearing for a fine day. Dec. 25, 1906, 10 a.m., at Tunbridge Wells.
11 Clouds. Dec. 25, 1906, 10.30 a.m., at Tunbridge Wells.
12 Clouds. Fracto Nimbus. May 6, 1907, 4 p.m., at S.P.O.
13 Clouds. Alto Cumulus. May 10, 1907, 11.33 a.m., at S.P.O.
14 Clouds. Alto Cumulus. May 10, 1907, 12.15 a.m., at S.P.O.
15 Clouds. Cumuli. May 15, 1907, 10.15 a.m., Tunbridge Wells.
16 Clouds. Nimbi and Rail Squall. May 15, 1907, 2.30 p.m., Tonbridge Wells.
17 Clouds. Nimbi and Rail Squall. May 15, 1907, 11.33, at Tunbridge Wells.
18 Clouds. Cumulus. June 12, 1907,, 11h. 55m. 30s. a.m., at S.P.O.
19 Clouds. Cumulus. June 12, 1907, 11.55 a.m., at S.P.O.
20 Clouds. Cirrus and Cumulus. June 12, 1907, 3.7 p.m., at S.P.O.
21 Clouds. June 20, 1907, 1.15 p.m., at S.P.O.
22 Clouds. Cumuli. Kite-flying at Snodingdale, July 1, 1907.
23 Clouds. Cirrus. Oct. 10, 1907, 2.30 p.m., at S.P.O.
24 Clouds. Cirrus. Jan. 17, 1908, 1.30 p.m., S.P.O., S. Kensington.
25 Clouds. Solar Rays. March 12, 1908, 1.30 p.m. at S.P.O.
26 Clouds. Alto Cumulus. May 11, 1908,, 7.30 a.m., at Tunbridge Wells.
27 Clouds. Alto Cumulus. May 11, 1908, 7.40 a.m., at Tunbridge Wells.
28 Clouds. Alto Cumulus. May 11, 1908, 7.45 a.m., at Tunbridge Wells.
29 Clouds. Large Cumulus. June 4, 1908, 1.40 p.m., at S.P.O.
30 Clouds. Cumulus. June 4, 1908, 1.42 p.m., at S.P.O.
31 Lightning. June 2, 1908, 2.23 p.m., at Earls Court.
33 Lightning Flashes. July 3, 1908, 11 p.m., at Earls Court.
33 Solar Halo. July 6, 1908. 1.45 p.m., at S.P.O.
34 Clouds. Fracto Cumulus and Cirrus. July 26, 1908, 10.35 a.m., at Tunbridge Wells.
35 Clouds. Stratus. August, 1908, Even Sky, Westgate.
36 Clouds. Cirrus and Cumulus. August 11, 1908, 7.11 p.m., Westgate.
37 Rainbow. On the Road to the Breeken. August 28, 1908.
38 Clouds. Cirro-Cumulus. Sept. 17th, 1906, 5.20 p.m., at S.P.O.
39 Fog broken up into Cloudlets, from Balloon, 1,200 ft. Nov. 1, 1908.
40 August, 1907. Alto-Stratus Cloud at Westgate-on-Sea.
41 August 11th, 1908., 7.10 p.m. Cumulus, fracto-Cumulus and Cirro-Cumulus. Sunset at Westgate-on-Sea.
42 May 31st, 1909 12.45 p.m. Alto-Cumulus clouds over S. Kensington.
43 Sept. 3rd, 1909. 4.30 p.m. Sunbeams.
44 Feb. 16th, 1909. 1.10 p.m. Cirro-Cumulus Clouds over S. Kensington.
45 Feb. 20th, 1911. 5.40 p.m. Sunset off Cape Guardefui. Showing fracto-Cumuli clouds.
46 Feb. 27th, 1911. Sunset in the Doldrums. Showing the typical flat bottomed Cumuli of that region.
47 Feb. 28th, 1911. Sunrise in the Doldrums. Showing distant Cumuli and Stratus cloud.
48 June 17th, 1911. A thunder-storm passing across the Grand Canyon of Colorado. Showing thunder cumulo-nimbus with rain falling.
49 May 25th, 1913. A Sea Fog rolling into Sidmouth Bay and town. Taken from Salcombe Hill at a height of 550 ft.
50 December 1st, 1913. A rainbow photographed from Salcombe Hill near Sidmouth.
51 December 13th, 1913. Ground Mist in the valley of Sidmouth.
52 November 18th, 1922. Taurid. Fire Ball. Polar Star, trails in addition.
53 North Pole Star Trails, September 7th, 1923.
54 Sunset from Norman Lockyer Observatory, showing Cumulus and cirrus clouds

See also page 91.

See also "Cloud Studies," "Geology," Section 4, and "Art and Literature and Miscellaneous," Section 9 of this Catalogue.

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17 A Dine's Record.
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19 A Raingauge.
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21 Electrical Self-Recording Raingauge.
22 A Week's Rainfall.
23 Three Records of a Gale.
24 Evaporation Tanks.
25 Cloud Forms—Cirro-Stratus.
26 Cloud Forms—Cumulus.
27 Measuring Heights of Clouds.
28 Lightning Flashes.
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30 A Daily Report from the Meteorological Office.

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8 Thermometers.—Fahrenheit & Cent Scale, Both Thermometer Scale of Temperature
9 Sixes Maximum and Minimum Registered Thermometer
10 Terrestrial Radiation and Solar Radiation Maximum with Blackened Bulb in Vacuum Thermometers
11 Solar Radiation and Maximum Register Thermometers
12 Window Thermometers on Brackets
13 Thermometer Screen for holding Thermometers
14 Hygrometer, Wet and Dry Bulb
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19 Differential Thermometer
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See also bottom of page 112, and "Medical," Section 1 of this Catalogue.

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9 " " " "
10 " " " "
11 Ice Crystals (Flowers of Ice), showing growth phases of the thin discordial disc form
12 " " " "
13 Star-shaped Crystal of Ice, highly magnified.
14 Double Snow Crystal, collar-stud pattern
15 Weird formation of a group of Frost Crystals.
16 Frost Crystals on a window-pane.
17 Group of nine Snow Crystals, showing geometric designs, from drawings.
18 " " "
19 " " "
20 " " "
21 Quartz Crystal uncut, showing natural form.
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CHEAP SERIES.

If it is desired tn purchase slides at a lnwer rate than the best colnnred prices quoted at the headings nf the varinns sets in the Catalngue, Messrs. NEWTON are ahle tn supply them wsll colnnred at 5/- tn 6/6 each.

Cnstnmers' nwn slides can be painted in this cheaper series at prices varying from 3/- each.

LIGHT WOODEN VARNISHED SLIDE BOXES.

These are very strnng, light, and cheap; they are made in twe sizes, and ths straps are fixed so as tn prevent their being lnst.

No. 20. To hold abont 40 slides, with strap and hnckle £0 2 3
No. 21. To hnld about 60 slides, with strap and huckle 0 3 0

GROOVED WOODEN SLIDE BOXES.

With dovetailed cnrners and numhered grooves, hrass hinges, end two catch lastenings, index label in lid; cleanly finished. Tn hnld 24, 36, 50, 60 nr 100 Slides. Prices nn applicatinn.

PADDED WOODEN SLIDE BOXES.

AS MADE FOR THE LONNON COUNTY COUNCIL.

75. Varnished Oak or Mahngany Slide Bnxes, with divisinns, safety hoqk, felt packings, carrying strap gning all rnund box, extra strnng fnr travelling; 3-space fnr 50 slides, 13s. 6d.; 4-space fnr 70 slides, 15s. 6d.

NEW TRAVELLING BOX.

ATTACHÉ PATTERN.

This is made similar to an attaché case, end in twn sizes. Lined felt throughout, leather handle and safety hooks. In either mehngeny nr nak.

85 Small size, to carry 120 slides £1 1 0
86 Large size „ 160 „ 1 7 6

CHEAP LANTERN SLIDE TRANSIT BOXES.

106 Blackened Whitewood, to hnld ahout 80 slides, with threa clnth-covered divisinns, felt top and hnttnm pads tn guard against hreakage, snd strong leather strap fnr carrying .. .. each £0 7 0
108 Dittp, to hnld 100 slides .. .. „ 0 10 6
107 In polished mahngany, fnr 60 slides .. .. „ 0 10 6
108 Ditto, for 100 elides .. .. „ 0 18 6

"NEWTONIAN" SAFE-TRANSIT DESPATOH BOX.

Patent 11835.

DESCRIPTION:—Varnished Wnoden Box, with Strap-handle. An inner light wooden box contains the Slides, and reste upon straps fastened on the fnnr inner sides nf tha nuter box. Made in twn sizes; to carry about 40 Slides, 15s. 0d.; to carry about 60 Slides, 16s. 6d.

The prices includa the inner box and etraps.

Fnr those who prefer to have their Slides in ooe of the ordinary woodeo boxes, a similar varnished and padded outer case with strap can be snpplied, which takes a box 12 in. hy 4½ in. hy 4½ in. Price, 13s. 6d.

This price does oot inclode the ioner box.

LANTERN SLIDE CABINETS.

Tha most coovenieot way nf stnring elides is in Cabinets contaioing as many drawers as are required. These are well finished in varnished whitewood; each drawer hnlds abont 60 slides. They arn also snpplied in dark polished oak, the drawers being of whitewood, faced with oak.

Similar Cahinets can he supplied with any numher of drawers, and, if desired, combined with a cupboard nr shelves belnw tn contain oddments and books nf lectures, &c. Prices can ba qooted when we knnw the exact reqoirements.

		In Whitewood.	Io Dark Oak.
125	CABINET, comprisiog 4 drawers	£1 7 6	£1 15 0
126	CABINET, cnmprising 6 drawers	1 17 6	2 2 0
127	CABINET, comprising 9 drawers	2 5 0	2 10 0
128	CABINET, comprising 12 drawers	2 15 0	3 3 0

Full details of other boxes supplied will be sent on application.

MATERIALS FOR MAKING AND OOLOURING SLIDES.

180	Transparent Notice Plates, fnr writing with nrdinary pen (1 doz. In hox)	£0 1 6
181	Opaque Notice Plates, fnr scratching with hard nsedle (1 doz. In box)	0 1 6
183	Lantern Size Dry Plates .. .. per packet of 1 doz.	0 2 6
184	Cover Glasses fnr ditto, epecially selected .. .. .. per doz.	0 1 0
185	Box of Lantern Masks	0 1 0
186	Packet of Binding Paper	0 1 0
187	Box of White Paper Spots, fnr marking slides	0 0 9
188	Numbers fnr putting nn slides, 1—50..	0 0 9
190	Glass Painting, transparent colours and materials fnr painting lantern slides, tnbes nf moist colours, spirit, spatula, medium, brushes, palette, &c., in case	Prices on application

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MESSRS. NEWTON & CO., LTD., have the pleasure to announce that the following list of Educational Lantern Lectures with Readings has been compiled from their Catalogues.

These interesting and instructive Lecture Sets are very highly recommended for general educational use.

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The [illegible] Birds of Our Gardens.
[illegible]
[illegible]
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The Life History of a Butterfly.

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[illegible] Sites and [illegible]
[illegible] ... 2 "
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